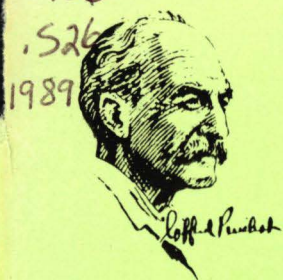


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Consortium for Environmental Forestry Studies: *A Lesson in Cooperation*

By: Glenn Sandiford • Lee P. Herrington



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- Consortium for Environmental Forestry Studies

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The Consortium for Environmental Forestry Studies brought together the U.S. Forest Service and as many as twelve northeastern universities to collaborate on urban forestry research. The Consortium was organized into nine working groups of scientists in the areas of forest amenities, air quality, genetics, insects and disease, planning and management, social and behavioral issues, soils, water resources, and wildlife. Between 1971-84, the Forest Service awarded these working groups more than \$2.8 million in research grants. Their 191 projects gave rise to a whole new body of research, several important symposia, and a bibliography of some 330 references, including a number of major texts. The Consortium also facilitated communication and interaction within urban forestry, notably between researchers; between institutions; between the Forest Service and institutions; and between researchers and practitioners. In 1986, the Consortium ceased to function, though not before it had provided a new component of forestry with a strong sense of identity and direction, established a permanent constituency of professional contacts and organizations, and generated a wealth of knowledge about how the urban forest can best meet the demands of urbanite populations.

The Consortium for Environmental Forestry Studies: A Lesson in Cooperation

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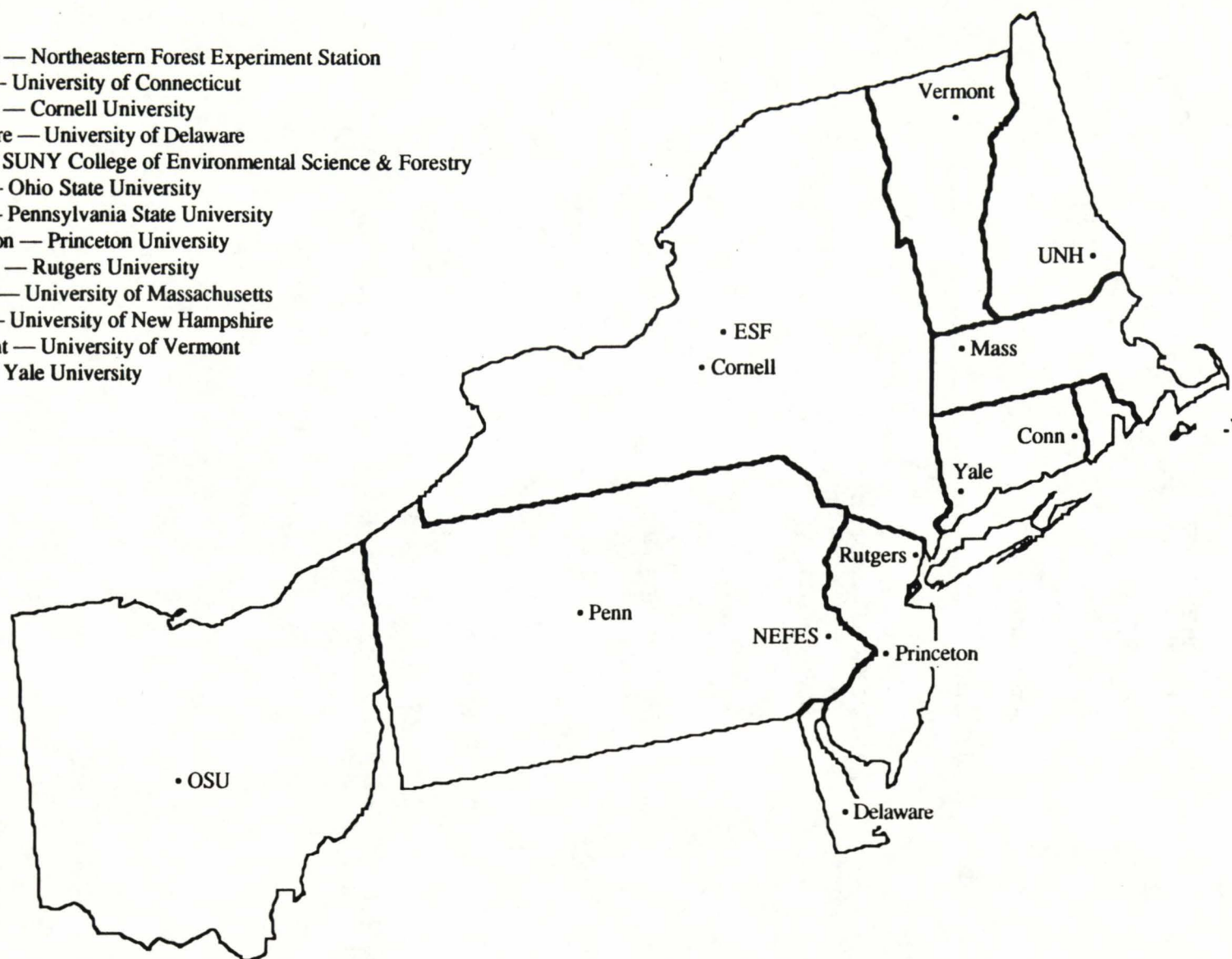
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- NEFES — Northeastern Forest Experiment Station
- Conn — University of Connecticut
- Cornell — Cornell University
- Delaware — University of Delaware
- ESF — SUNY College of Environmental Science & Forestry
- OSU — Ohio State University
- Penn — Pennsylvania State University
- Princeton — Princeton University
- Rutgers — Rutgers University
- UMass — University of Massachusetts
- UNH — University of New Hampshire
- Vermont — University of Vermont
- Yale — Yale University



THE CONSORTIUM FOR ENVIRONMENTAL FORESTRY STUDIES

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PREFACE

This monograph is intended primarily for two audiences. Professionals in urban forestry, and particularly those in the northeastern United States, will find it a valuable reference source for applied research results. The Consortium generated an impressive volume of information for urban foresters, and much of it remains state-of-the-art even after as many as fifteen years. The contents will also prove useful to research administrators in both public agencies and private institutions. Research studies today typically require vast amounts of money, manpower, and resources. The Consortium demonstrated the effectiveness of cooperative arrangements in generating quality research proposals, as well as the significant role played by small but strategic seeding grants.

The monograph is set out in three parts. It begins with an historical analysis of the Consortium and its activities. The second section contains more detail as it critically examines the most important components of the Consortium program, namely working groups, grants, proposal reviews, and technology transfer, before summarizing the legacy of the Consortium today. The paper closes with a complete bibliography of all reports and publications generated by the Consortium.

An undertaking of this nature and size requires input from many quarters. We would like to begin with a word of thanks to Eileen Brennan, Professor Emeritus at the State University of New Jersey (SUNJ) Cook College; Richard DeGraaf, Principal Research Wildlife Biologist, Northeastern Forest Experiment Station (NEFES), USDA Forest Service; Warren Doolittle, former NEFES Director, USDA Forest Service; Gordon Heisler, Research Forest Meteorologist, NEFES, USDA Forest Service; Brian Payne, Deputy Director of International Forestry, USDA Forest Service; Robert Romancier, Deputy NEFES Director, USDA Forest Service; and Elwood Shafer, Professor at Pennsylvania State University. Their guidance, interest, and support were a great source of motivation and ensured that we always remained on track.

We are also grateful for suggestions from Teuvo Airola at SUNJ Cook College; Donald Behrend at the University of Alaska-Anchorage; Robert Bond at the University of Massachusetts; Phillip Craul at the State University of New York College of Environmental Science and Forestry (SUNY CESF); David DeWalle at Pennsylvania State University; Anne Fege of the USDA Forest Service; Dave Funk of the USDA Forest Service; John George at Pennsylvania State University; Jeff Hayward of People, Places, and Design Research; Gerald Lanier at SUNY CESF; James Lassoie at Cornell University; Paul Manion at SUNY CESF; George Moeller of the USDA Forest Service; Norman Richards at SUNY CESF; William Smith at Yale University; William Sopper at Pennsylvania State University; Kim Steiner at Pennsylvania State University; and Larry VanDruff at SUNY CESF.

Ron Bouverat and Natasha Samant, Graphics Supervisor at the Center for Instructional Development, Syracuse University, and Graduate Assistant in the College of Visual and Performing Arts, Syracuse University, respectively, helped design and print this monograph.

Finally, special thanks go to Albert Foulger, Assistant Station Director, South, NEFES, USDA Forest Service. Reminiscing about the Consortium with such an embattled veteran was a pleasure and a privilege.

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Glenn Sandiford
Lee Herrington

April 1989

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INTRODUCTION

Forestry is the management of trees and forests to provide sustainable benefits for various users, primarily man. Europeans recognized those benefits as early as the fourteenth century, but it was not until Gifford Pinchot's dream became the U.S. Forest Service in 1905 that forestry truly established itself in the United States.

The Forest Service initially focused on the vast expanses of rural woodlands where settlements were few and far between. Management of these forests served two primary functions — **maintenance of natural processes; and provision of economic and social benefits.**

The importance of those functions has not diminished over time. But they have broadened. A growing trend toward urbanization forced the Forest Service to widen its horizons in the late Sixties, when leadership in the agency came to realize that forests and trees in and around the urban environment, such as those found in city parks, housing lots, suburban green spaces, and along transportation routes, could be equally productive. But their staff were not yet equipped with the skills to address, or in some cases even identify, the true nature of urban forestry issues. What little expertise did exist was loosely shared among the Forest Service and an assorted collection of professionals specializing in urban vegetation management — municipal horticulturists and arboriculturists, landscape architects, urban park planners, and so on.

As well as integration, urban forestry also needed a new influx of research money. Pollution, congestion, ugliness, and decaying neighborhoods were all causing major headaches for local government. The problems were in part symptomatic of the destruction of open space, forest stands, and water resources within the urban environment. But traditional thinking in urban forestry could not respond to this new generation of urban concerns. Information needed to apply ecological criteria in land use policies was either incomplete or unavailable, and decision-makers were left with little choice but to accept proposals that neglected to consider the long range ecological consequences. Indeed, the short range cost/benefit standards of urban development nearly always enjoyed greater weighting than the long term ecological consequences.

Resolving these problems required the collective efforts of many. So the Forest Service's Northeastern Forest Experiment Station decided to initiate a joint research operation involving itself, and several universities and research institutions. On 1 February 1971, the Consortium for Environmental Forestry Studies was established.

The Consortium set about to generate information necessary to redress the balance in urban development. What exactly were the benefits of urban vegetation? How did urban vegetation interact with its environment to produce these benefits? How could these benefits be maximized? Such was the task awaiting the Consortium for Environmental Forestry Studies when it took its first tentative steps in 1971.

EARLY DAYS: (1969-72)

The Consortium for Environmental Forestry Studies did not happen overnight. It required many months of groundwork by leadership in both the Forest Service and the universities. Paving the way was Warren Doolittle, Assistant Director for the Northeastern Forest Experiment Station (NEFES).¹ Doolittle was one of the first to acknowledge the significant contributions that urban forestry could make to the quality of life in metropolitan centers, and worked hard to spread the word among his fellow professionals. He also believed that any related research program should be based in the Northeast, which was the most populous area in the United States and thus most concerned about the problems of urban development.²

As the Sixties came to an end, Doolittle and NEFES Director Richard Lane won increasing support for urban forestry from their Forest Service counterparts in Washington DC. This prompted the NEFES to consider taking the initiative by creating new Research Work Units (RWU) where their scientists could undertake urban forestry-related studies. The idea of collaborating with university researchers through a consortium also gained momentum. Initially proposed by Keith Arnold, Deputy Chief of the Forest Service, a consortium format would not only allow the Station to tap a wider range of expertise, it would also stimulate a major cooperative program with the universities, something the NEFES had never previously tried.

While efforts were made to win congressional funds, the NEFES contacted several northeastern universities offering graduate programs in forestry with a view to establishing a consortium. The universities expressed interest, and so a meeting was called in February 1970. Representatives from ten institutions met with Arnold, Doolittle, Lane and other Forest Service personnel in Milford, PA, at the former home of Gifford Pinchot. Among the topics discussed was the possibility of Forest Service funding for urban forestry research proposals submitted by a consortium of universities. The representatives responded positively.

Thereafter, events moved quickly. Richard Pentoney from the State University of New York (SUNY), Francois Mergen of Yale University, and the NEFES' Ben Roach began work on a charter for the proposed consortium. Then Massachusetts Representative Silvio Conte came through with a \$320,000 appropriation for the NEFES's first research unit in urban forestry. Located on the University of Massachusetts campus in Amherst MA, the RWU would house a multi-disciplinary team developing policy guidelines to maximize social benefits of urban forests, such as wildlife, recreation, and landscaping. It would receive approximately half the appropriation, leaving the remainder to be divided among consortium members as research grants.

On 1 July 1970, with the appropriation safely confirmed, the NEFES announced the creation of a new research program known as the Pinchot Institute of Environmental Forestry Research.³ Forest Service Chief Edward Cliff later explained that like the pioneering work of its namesake seventy years earlier,⁴ the research program would add another dimension to forestry by generating new knowledge about the role of trees and forests in urban centers.⁵

By the end of the year, Warren Doolittle had become NEFES Director. One of his first actions was to appoint Elwood Shafer as an Assistant Director at the Station with special assignment as Program Coordinator for the Pinchot program. Then, on 1 February 1971, after a series of meetings throughout the previous twelve months, the NEFES and nine northeastern research institutions signed the first charter of the Consortium for Environmental Forestry Studies (see APPENDIX ONE). Though focusing on urban forestry, the universities incorporated the term "environmental forestry" into their title to encourage greater breadth in their research activities. Indeed, urban forestry was so new at that time that there was some confusion as to what the term actually constituted.⁶

The Consortium's charter members were the University of New Hampshire; Yale University; University of Connecticut; Massachusetts Agricultural Experiment Station; Princeton University; Cornell University Agricultural Experiment Station; State University of New

¹NEFES headquarters were based in Upper Darby PA until September 1978, when the Station moved to Broomall PA.

²Doolittle, W.T. 1969. Research in Urban Forestry. *Journal of Forestry*, 67 (9): 650-656.

³Doolittle, W.T. 1970. A New Role for the Pinchot Institute. *Pennsylvania Forests*, 60 (3): 81.

⁴Pinchot, G. 1947. *Breaking New Ground*. Harcourt, Brace and Company: New York. 522pp.

⁵Cliff, E.P. 1971. *Trees and Forests in the Human Environment*. In: S. Little and J.H. Noyes (eds.), Proc. Symp. on Trees and Forests in an Urbanizing Environment. Monograph Series No. 17, University of Massachusetts Coop. Ext. Serv., Amherst, MA: 17-21.

⁶In a 1973 unpublished paper, Dr. Norman Richards from the Faculty of Forestry at the SUNY College of Environmental Science and Forestry defined *urban forests* as "the land-centered three-dimensional space resource outside of but inter-relating with and interconnecting the various highly structured land uses in urban and heavily urban-impacted landscapes, and which is therefore primarily of environmental value to people". He then goes on to explain that *environmental forestry* is "the scientific management of forest resources.... primarily for their service values". The Consortium intended to bring the two sides together as *urban environmental forestry*, focusing on the service values of urban forests.

York College of Environmental Science and Forestry; Rutgers University; and Pennsylvania State University. Together with the NEFES and its new Amherst research unit, they made up an impressive pool of research talent that the Pinchot Institute could call upon.

The NEFES had considered the consortium approach the most appropriate mechanism through which to award funds for urban forestry research. The format would allow a broad array of concerns to be studied, many of which could not be approached by a single institution or agency. A consortium would also facilitate coordination of research among the institutions. Put simply, the Consortium would review research proposals from university and Forest Service scientists, rank them, and then recommend those with the highest ratings to the NEFES for funding.¹ The latter would provide funds through grants to the individual universities.

Elwood Shafer wasted no time in putting the universities to work. Within eight months of signing the charter, they were involved in a recreation management symposium in Syracuse, NY.² Then came a second opportunity for national exposure when the Consortium sponsored a 1972 symposium on "Recycling Treated Municipal Wastewater and Sludge through Forest and Cropland". Before they could begin any research studies, Consortium scientists had to identify current needs, issues, and technologies in their particular disciplines. In this instance, it was disposal of municipal wastewater and sludge. Their best bet was to bring together a large group of practitioners and listen to what they had to say. The scientists drew up a program accordingly, and were then amazed when their notices drew an international audience of over 400.³

The symposium also provided an occasion to tap outside funds. Consortium sponsorship gave the organizers some "legitimacy" in their efforts, and as a result, the US Environmental Protection Agency (EPA) and NEFES each agreed to buy \$3000 worth of the proceedings. The USDI Office of Water Resources Research also gave support. By generating supplementary funds from external sources, Consortium grants were already serving as seed money, just as Doolittle and the others had intended.

Meanwhile, the Pinchot Institute was expanding, thanks to a Senate appropriation for a second urban forestry research unit. Based this time in Pennington, NJ, NEFES researchers would study management techniques to maximize the physical benefits of urban forests, as well as multiple use management procedures for municipal watersheds in the northeast. More specifically, they would examine the effect of trees on noise, temperature, and humidity, and how best to combine recreation opportunities on municipal watersheds with water quality maintenance. Once again, half the appropriation would go to the unit, and half to the universities.

The Institute's management structure had also begun to take shape by 1972. Overall control lay with the Station's Urban Forestry Program Coordinator, who directed the NEFES' in-house research units and coordinated all Institute-related projects as part of the Station's overall research program. Program Coordinators also acted as a link between Consortium members and the Forest Service — at NEFES meetings, they represented Consortium interests but spoke on behalf of the Forest Service at Executive Committee meetings of the Consortium.

The Executive Committee was responsible for routine operation of the Consortium. It consisted of four officers — President, First Vice-President, Vice-President for Research, and Secretary-Treasurer — plus the Program Coordinator.⁴ Unlike the latter, who was appointed by the NEFES, Executive Committee officers were elected by the institutional representatives from their membership, each for a two-year term. All four had specific roles to play (see APPENDIX ONE). At the helm was the President, whose responsibilities included appointment of various committees, development of agendas, chairing meetings, and preparation of an annual report. If and when necessary, the First Vice-President could perform these tasks on behalf of the President. Normally though, the former would spend most of their time assisting the President.

The Vice-President for Research handled all research matters. Priority was given to the development of procedures for research proposal submission and evaluation. They also supervised the review and ranking of proposals, and made recommendations for Consortium research funding.

With the exception of research grants, which the NEFES awarded, all Consortium finances were the responsibility of the Secretary-Treasurer. They provided reports at the annual meetings on administrative costs and travel expenses, and were also responsible for various secretarial duties such as mailing lists, minutes of Consortium meetings, and mail ballots.

¹Only university scientists could submit individual proposals to the Consortium. Forest Service researchers were restricted to cooperative projects with university scientists, who would receive all the grant if their proposal was successful.

²Northeastern Forest Experiment Station. 1971. Recreation Symposium Proceedings. NE. For. Exp. Sta., Broomall, PA. 211pp.

³Sopper, W.E. and L.T. Kardos (eds.). 1973. Proc. Symp. on Recycling Treated Municipal Wastewater and Sludge through Forest and Cropland. Pennsylvania State University Press, University Park, PA. 479pp.

⁴The Program Coordinator was not allowed to serve as an Executive Committee officer. Instead he/she sat in on Executive Committee meetings as a non-voting member, and represented the Forest Service.

Though specific policy matters were often left in the hands of the Executive Committee, it was the institutional representatives who dealt with general policy. Appointed by the universities, the representatives would gather at Consortium annual meetings to discuss new membership requirements, charter reviews, and so on. Institutional representatives provided a link between their own administrations, university scientists, and the Consortium.

Working together, the Program Coordinator, Executive Committee, institutional representatives, and member scientists sought to determine how trees and forests could best serve the interests of urban populations. But as they began to tackle some of the problems through meetings with practitioners, they soon realized the need for a plan of attack. How did the urban forest affect metropolitan environments? And once the effects were recognized, how could the Pinchot Institute work toward resolving some of the related problems?

To enable member scientists to resolve such questions, Otis Hall, a University of New Hampshire faculty member who was then serving as president of the Consortium, was granted funds to support a series of workshops. Between 1971-72, six different groups held a total of fifteen workshops. Areas of interest were cultural developments, urban wildlife, recreation and aesthetics, land use planning, forest amenities, and wastewood utilization. Research needs in each field were analyzed, followed by the development of coordinated research approaches to meet those needs.¹

The workshops and other Consortium-related meetings gave rise to a four-tier model of research management (see FIGURE ONE). Following an assessment of urban forest benefits, researchers would conduct a two-pronged investigation of the ecological processes through which the urban forest affects the urban environment, and secondly, basic biology of the urban forest. In both cases, there were significant gaps in the existing body of knowledge that required immediate study.

Armed with this new information, the Institute could develop urban forest management techniques and guidelines to help improve the urban environment. Finally, moving to a step sometimes forgotten by research agencies, Pinchot scientists would develop strategies that encouraged metropolitan decision-makers to integrate the management recommendations into local and regional government functions. As the 1972 wastewater symposium had indicated, it was essential that the Institute's research be practically oriented, and provide real and tangible benefits for urban populations.

The series of workshops funded through Hall's grant not only helped establish a research program, they also gave notice that the Pinchot Institute had recognized the importance of communication and interaction in research. The grant was only the first of several set aside to cover travel and administrative costs so that scientists could get together for regular meetings and discussions. **These funds were kept separate from Consortium research grants to ensure that scientists could continue to interact irrespective of whether they had a current research grant.** For those working at land-grant institutions, where travel funds are often limited, such monies were especially welcome.

The development of a research methodology brought the Pinchot Institute's first stage of growth to a close. In less than two years, it had formed what it thought was an effective, though essentially untested, management structure capable of sustaining quality research.² Funds were available and there was a whole host of research topics under the umbrella of urban forestry. Initial contacts and publicity had been achieved through some early journal articles and the two symposia. Now the Institute needed to put everything together and generate some information that practitioners could use in and around the towns and cities of the northeast.

¹Hall, O. and D.P. Olson. 1973. *Current Research on Improving the Human Environment in the Urban Forest Interface of the Northeast*; a review. Institute of Natural and Environmental Resources, University of New Hampshire, Durham, NH. 43pp. (unpublished)

²Mawson, J.C., E.L. Shafer, Jr., J.W. Thomas, R.W. Wilson, Jr. and D.P. Worley. 1973. *The Pinchot Institute System for Environmental Forestry Studies*. USDA Forest Service Gen. Tech. Rep. NE-2, NE. For. Exp. Sta., Broomall, PA. 60pp.

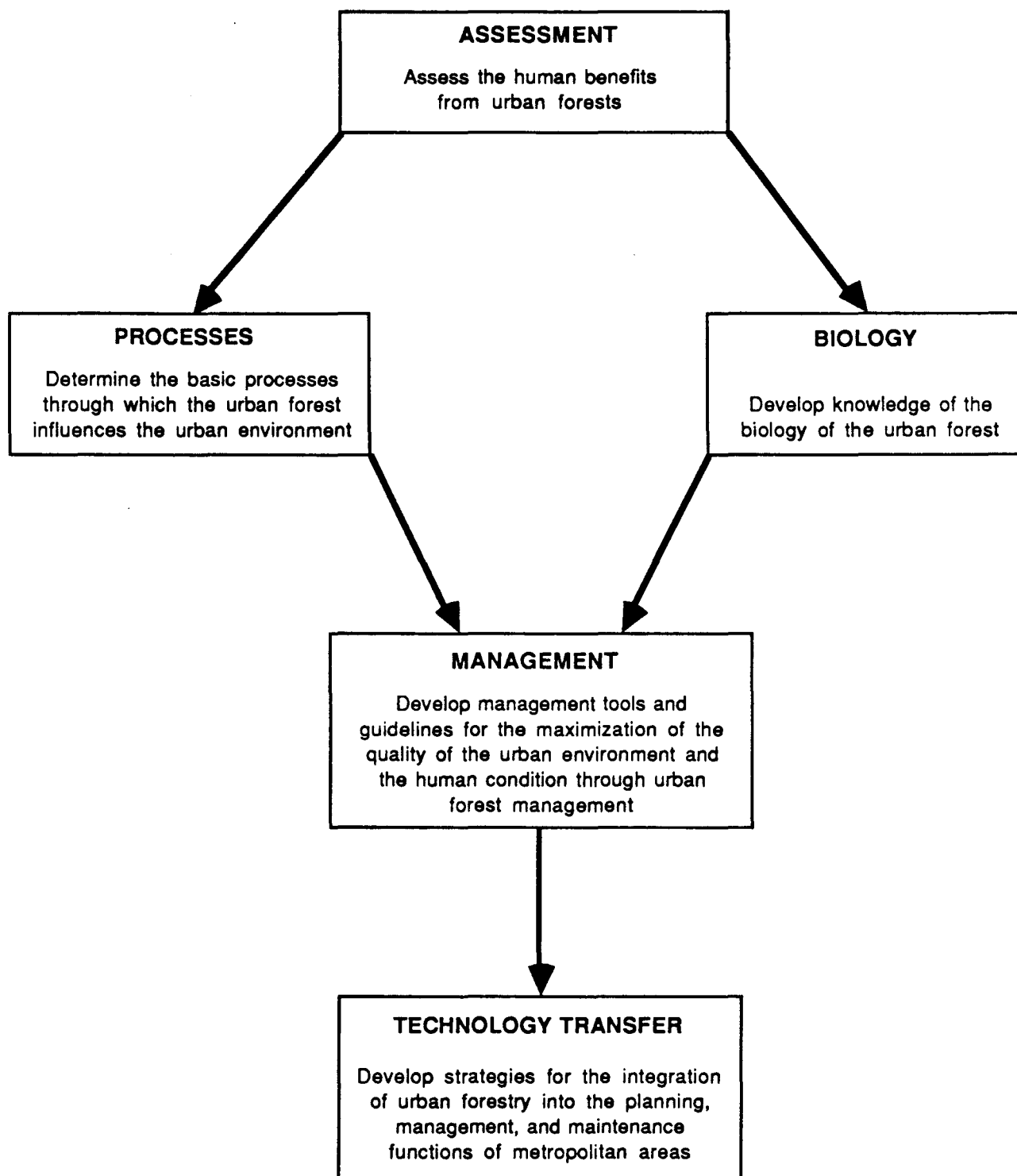


FIGURE ONE: Components of Urban Forestry Research

FINDING ITS FEET (1973-74):

The Pinchot Institute's welcome into the arena of urban forestry was not entirely warm. Arborists in particular felt that their patch was being invaded. But the initial resistance gradually diminished as it became apparent that the Institute was interested primarily in interactions between trees and the urban environment, rather than in trees as a separate entity. Thereafter the two groups frequently complemented each other, the practitioners identifying needs and the researchers generating information.

A case in point was the second water-related symposium sponsored by the Consortium. Municipal watershed management was the focus this time. The organizers wanted to make their program accessible to watershed administrators throughout the northeast. So they opted to locate the symposium first at Pennsylvania State University, and then repeat it in its entirety at the University of New Hampshire. This enabled them to reach a total of 245 professionals, which in turn meant greater exposure for the Consortium. The symposium also proved to be the second time that Pennsylvania State University scientist William Sopper and others managed to win supplementary monies for a Consortium-sponsored event. On this occasion, the University of New Hampshire, Pennsylvania State University, and USDI Office of Water Resources Research all contributed.¹

Other notable symposia in 1973 included one on landscape assessment at the University of Massachusetts and another on urban wildlife in Springfield, MA.² But while conferences all helped promote the Consortium, they did not necessarily aid its development.

As of 1972, all proposals submitted to the Consortium had been developed according to the interests of each individual scientist. This led to a program that lacked cohesion and overall focus. As a result, Elwood Shafer asked a small group of scientists to submit a proposal for an Amenities Working Group, complete with a comprehensive outline of a research program. The group, consisting of Lee Herrington, Gordon Heisler, David Miller, and David DeWalle³ had their proposal accepted by the NEFES in 1973, and the first working group was born.⁴ Later that year, Henry Gerhold, a leading tree geneticist from Pennsylvania State University, assembled a Genetics Working Group. Then came successful proposals for working groups in Air Quality, and Planning and Management.

Nine was the final count. Reflecting the inter-disciplinary nature of urban forestry, the working groups covered a wide variety of concerns — amenities, genetics, air quality, planning and management, soils, water quality, social and behavioral issues, wildlife, and insects and diseases. Each provided a mechanism for researchers with common interests to come together to discuss technical matters, and at least one faculty member from each university campus was encouraged to become an active member in the working group pertinent to their interest. Chairpersons led each group, coordinating activities, requesting research proposals, reviewing proposal outlines, and providing a line of communication between the Executive Committee and working group members (see WORKING GROUPS).

The arrival of working groups heralded a period of rapid expansion for the Consortium. Improved cooperation across campus and with NEFES researchers enlarged perspectives and broadened the scope of research. Executive Committee members also found that proposals involving several disciplines were usually more thorough, better written, and provided more research production per dollar invested. The benefits quickly followed. Air Quality Working Group scientists led by Eileen Brennan at Rutgers University published a series of articles about air pollution damage to New Jersey trees.⁵ In a particularly innovative study of urban and suburban property values, Brian Payne found that trees contributed as much as 27 per cent of appraised land values.⁶ The *Journal of Forestry* accepted one summary paper by Lee Herrington of SUNY CESF describing how trees can attenuate noise from factories and highways, and a second synopsis by the NEFES's Gordon Heisler in

¹Northeastern Forest Experiment Station. 1975. Proc. Symp. on Municipal Watershed Management. USDA Forest Service Gen. Tech. Rep. NE-13. NE. For. Exp. Sta., Broomall, PA. 196pp.

²Zube, E.H., R.O. Brush and J.G. Fabos (eds.). 1975. Landscape Assessment: Value, Perceptions, and Resources. Halstead Press, NY, NY. 367pp.; Noyes, J.H. and D.R. Progulski (eds.). 1974. Proc. Symp. on Wildlife in an Urbanizing Environment. University of Massachusetts Coop. Extension Serv., Monograph Series No. 28. Amherst, MA. 182pp.

³SUNY College of Environmental Science and Forestry, Forest Service, University of Connecticut, and Pennsylvania State University respectively.

⁴Forest Amenities Working Group. 1973. Forest Amenities: Research Program of the Forest Amenities Working Group. USDA Forest Service, NE. For. Exp. Sta., Broomall, PA. 181pp.

⁵Rhoads, A.F. and E. Brennan. 1974. Impact of Air Pollution on Trees in New Jersey. In: Proc. Amer. Phytopathological Soc., 1: 142; Air Pollution Effects Studied. *American Christmas Tree Journal*. (February): 25-28; 1975. Fluoride Damage to Woody Vegetation in New Jersey in 1974. *Plant Disease Reporter*, 59 (5): 427-429.

⁶Payne, B.R. 1973. The Twenty-nine Tree Home Improvement Plan. *Natural History*, 82 (9): 74-75.

which he discussed the ability of trees to ameliorate urban microclimates.¹ Another Amenities project generated sufficient data for a M.S. thesis on the function of physical design in the microclimate of city spaces.² Julius Fabos from the University of Massachusetts was awarded a grant to continue his work on the Metropolitan Landscape Planning Model (METLAND) project, looking at how environmental factors could be given an equal footing with economic and other values in the decision making process.³

Working groups completed the Pinchot Institute picture. In addition to a growing reputation, it now employed a management structure that satisfied the needs of both the Forest Service and the Consortium. The program was simple, efficient, and effective. Directed from the bottom by practitioners and researchers and coordinated from the top by the Executive Committee, it proved so successful that the next decade saw it remain virtually unchanged. Indeed, as 1975 unfolded, the NEFES awarded the working groups close to \$300,000 in grants, almost double the amount it had allocated in each of the previous three years. Together with the Station, the Consortium was rapidly putting urban forestry on the map.

¹Heisler, G.M. 1974. Trees and Human Comfort in Urban Areas. *Journal of Forestry*, 72 (8): 466-469; Herrington, L.P. 1974. Trees and Acoustics in Urban Areas. *Journal of Forestry*, 72 (8): 462-465.

²Vittum, J. 1974. The Physical Structure of City Space and Its Affect on Micro-Climate and Human Thermal Comfort. M.S. Thesis. SUNY College of Environmental Science and Forestry, Syracuse, NY. 253pp.

³Fabos, J.G. 1974. Are We Building on Flood Plains? Some Findings of the METLAND Study. *Findings* (May-June). Mass. Agr. Exp. Sta., Amherst, MA: 3-4.

MATURITY (1975-79):

The Executive Committee now began to apply some of the lessons learned during the early years. Having observed, for example, that promoting their organization could lead to funding supplements from external sources, as well as from the Forest Service itself, they began pushing even harder for publication lists, conferences, and other 'indicators of usefulness'.

As a result, the Consortium became much more visible, sponsoring three major symposia in 1975 alone. A large audience came to Washington DC during the spring to hear presentations on "Children, Nature, and the Urban Environment".¹ Then a team from Amenities helped put together a conference on the "Metropolitan Physical Environment".² The latter was particularly inter-disciplinary in nature, thanks to the organizers having recruited several scientists from other working groups to sit on the conference program committee. Finally, selection and breeding of trees for metropolitan landscapes was the focus of a fall conference organized by the Genetics Working Group with financial assistance from the USDA Agricultural Research Service, Forest Service, and Pennsylvania State University.³

Another twenty-nine technical reports were completed in 1975, notably on the impact of wastewater and sludge on forest soils;⁴ genetic information needs for metropolitan trees;⁵ and the impact of different vegetative types on noise attenuation.⁶ Richard DeGraaf and Brian Payne from the NEFES research unit at Amherst also published the results of their study on the economic benefits of non-game wildlife, which they estimated at \$500 million.⁷ In all, the Consortium had sponsored 68 studies by the end of 1975.

As funding for another seventeen proposals was announced in the spring of 1976, the Executive Committee was presented with the results of an independent review of Consortium management. The results of that review suggested that their move toward a more forceful leadership style during the previous year was indeed headed in the right direction. Scientists had indicated to the reviewers "that while they received intellectual stimulation and some research funds from the Consortium and recognized its long-term importance, they did not receive the leadership and aggressive advocacy which was needed to bring the field to public notice and to obtain broader support".⁸

The review provided further momentum. The Executive Committee and working group chairpersons led the scientists through their most productive year ever for reports and publications, with forty-nine credited to the Consortium in 1976. Amenities researchers continued their studies of noise attenuation in and around forests,⁹ while scientists in Air Quality examined significant damage to trees caused by ozone, hydrogen fluoride and cement dust.¹⁰ The Soils Working Group had compiled sufficient data to begin analyses of soil compaction

¹Northeastern Forest Experiment Station. 1977. *Children, Nature and the Urban Environment: Proc. Symp. Fair*. USDA Forest Service Gen. Tech. Rep. 30. NE. For. Exp. Sta., Broomall, PA. 261pp.

²Northeastern Forest Experiment Station. 1977. *Proc. Conf. on Metropolitan Physical Environment*. USDA Forest Service Gen. Tech. Rep. NE-25. NE. For. Exp. Sta., Broomall, PA. 447pp.

³Santamour, F.S., Jr., H.D. Gerhold and S. Little (eds.). 1976. *Better Trees for Metropolitan Landscapes: Symp. Proc.* USDA Forest Service Gen. Tech. Rep. NE-22. 256pp.

⁴Richenderfer, J.L., W.E. Sopper and L.T. Kardos. 1975. *Spray-Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soils*. USDA Forest Service Gen. Tech. Rep. NE-17. NE. For. Exp. Sta., Broomall, PA. 24pp; Sopper, W.E. 1975. *Use of the Soil-Vegetation Biosystem for Wastewater Recycling*. In: R.L. Sanks and T. Asana (eds.), *Land Treatment and Disposal of Municipal and Industrial Wastewater*. Ann Arbor Science Publishers, Ann Arbor, MI: 17-43.

⁵Gerhold, H.D., A.J. Long and M.E. Demeritt, Jr. 1975. *Genetic Information Needed For Metropolitan Trees*. *Journal of Forestry*, 73 (3). 150-153.

⁶Brock, C.G. 1975. *Vertical Acoustic Energy Profiles as Affected by Vegetation and Atmospheric Conditions*. M.S. Thesis. SUNY College of Environmental Science and Forestry, Syracuse, NY. 93pp.

⁷DeGraaf, R.M. and B.R. Payne. 1975. *Economic Values of Nongame Birds and Some Research Needs*. *Trans. N. Am. Wildl. Nat. Res. Conf.*, 40: 281-287.

⁸Wakefield Washington Associates Inc. 1976. *Final Report to the Pinchot Institute Consortium for Environmental Forestry Studies on Assessment of Organization and Fund Raising Potential*. Washington DC. 16pp. (unpublished)

⁹Reethof, G. and G.M. Heisler. 1976. *Trees and Forests for Noise Abatement and Visual Screening*. In: F.S. Santamour, Jr., H.D. Gerhold and S. Little (eds.), *Better Trees for Metropolitan Landscapes: Symp. Proc.* USDA Forest Service Gen. Tech. Rep. NE-22. NE. For. Exp. Sta., Broomall, PA: 39-48; Reethof, G., L.D. Frank and O.H. McDaniel. 1976. *Absorption of Sound by Tree Bark*. USDA Forest Service Research Paper NE-341. NE. For. Exp. Sta., Broomall, PA. 6pp.

¹⁰Brennan, E. and A.F. Rhoads. 1976. *The Response of Woody Species to Air Pollutants in an Urban Environment*. *Journal of Arboriculture*, 2 (1): 1-5; Rhoads, A.F. 1976. *Forest Species Show a Delayed Response to Cement Dust in Soil*. *Journal of Arboriculture*, 2 (10): 197-199.

caused by construction of housing developments.¹ Also maturing was the Wildlife Working Group, whose members had completed some valuable research in avian distribution patterns.²

NEFES leadership was impressed with these endeavors. At the Consortium's 1976 annual meeting, Deputy Director Duane Lloyd made some very positive comments in his summary of a recent Forest Service review of the Consortium. Among his closing words, however, was a suggestion that the Consortium "encourage development of strategies for submission of proposals to outside agencies".

The recommendation was an interesting one. Initial research by the Consortium had simply scratched the surface of urban forestry. Nine different working groups plus an enormous increase in the number of proposal submissions had served to indicate that the discipline was immense and complicated, and those early indications had quickly been confirmed by the first working group problem analyses.³ Adopted in 1974, the problem analyses were an attempt to add some consistency to the proposal review process. Before then, proposals had always been reviewed on a case-by-case basis. But the rise in proposal submissions and increased competition among scientists and working groups had made it imperative that research priorities be established to ensure that the limited funds were shared in the most effective manner possible. The Executive Committee had opted for problem analyses, a formal document prepared by each working group that defined critical problem areas in their respective fields, reviewed existing state-of-the-art knowledge, and established procedures for coordinating research to resolve these problems. Each provided a consistent yardstick by which one proposal could be compared with another on the basis of their contributions to a particular component of urban forestry. Having decided upon problem analyses, the Executive Committee had then made it their policy to consider only those proposals that conformed with research priorities set out in the new documents, or drafts thereof. Only independent scientists were excluded from this policy.

The idea of problem analyses had succeeded. A better sense of priorities had enabled the working groups to produce sizeable research packages with well-defined objectives. This was fine from a research point of view but tough financially, for the new and improved proposals invariably required substantial additional funds. Furthermore, when NEFES personnel had studied these new breed of proposals in the light of the findings of the first problem analyses, it had become eminently clear to them that urban forestry research as a whole was going to need a massive injection of money from somewhere, one that the Station most certainly could not afford on its own. The recommendation put forward by Lloyd at the annual meeting had simply recognized this.⁴

Some Consortium scientists followed Lloyd's advice. One proposal to the Federal Highway Administration, for example, earned a research team from Amenities \$10,000 to continue a quantitative study of the role of trees in highway noise abatement that had been started with Consortium funds.⁵ But they were very much in the minority, for many others expressed concern that the Consortium might lose its collective strength and effectiveness if working groups or individuals were to independently seek outside grants in a piecemeal fashion. The latter preferred to let the Executive Committee solicit external funds.

The Station, meanwhile, maintained its strong support for the Consortium with funding for another seventeen proposals in 1977. The universities also continued with their activities, beginning with an important

¹Van der Grinten, M. 1976. The Effects of Housing Developments on Forest Structure, Composition, and Vigor. M.S. Thesis. University of Massachusetts, Amherst, MA. 58pp.; 1976. Bibliography of Soil Compaction Research; final report. 17pp.

²Forman, R.T.T., A.E. Galli and C.F. Leek. 1976. Forest Size and Avian Diversity in New Jersey Woodlots, With Some Land-Use Implications. *Oecologia* (Spring): 1-8; Galli, A.E., C.F. Leek and R.T.T. Forman. 1976. Avian Distribution Patterns in Forest Islands of Different Sizes in Central New Jersey. *The Auk*, 93: 356-364.

³Smith, W.H. and L.S. Dochinger (eds.). 1975. A Problem Analysis for Environmental Forestry Research: Air Pollution and Metropolitan Woody Vegetation. Yale University Printing Service, New Haven, CT. 74pp.; Sopper, W.E., J.A. Lynch and E.S. Corbett (eds.). 1976. A Problem Analysis for Environmental Forestry Research: Water Resources at the Forest-Urban Interface. NE. For. Exp. Sta. Gen. Tech. Rep. PA-2. USDA Forest Service, Broomall, PA. 47pp.; Manion, P. 1979. Insect and Disease Problems of the Urban Environment: Problem Analysis; final report. 5pp. (unpublished); George, J.L. 1982. Urban Wildlife: A Problem Analysis for Environmental Forestry Research. Agricultural Experiment Station, Pennsylvania State University, University Park, PA. 22pp.; Gerhold, H.D., K.C. Steiner, F.C. Cech and D.F. Karnosky. 1982. A Problem Analysis for Environmental Forestry Research: Genetic Improvement and Urban Trees. US Govt. Print. Off. 65pp.; Twight, B. 1982. Research Needs for Environmental Problems Related to Recreation and Landscape Management in Densely Populated Areas; final report. 17pp. (unpublished)

⁴This was later confirmed in a report that estimated the total budget for an urban forestry research and development program at something approaching \$150 million. Shafer, E.L., Jr., G.H. Moeller, H.K. Cordell and A.W. Magill. 1977. A Research and Development Program for Urban Forestry; final report. USDA Forest Service. 133pp. (unpublished)

⁵Borthwick, J.O., G. Reethof, O.H. McDaniel and D.E. Carlson. 1977. The Attenuation of Highway Noise by Narrow Forest Belts. *Journal of the Acoustical Society of America*, 62 (suppl. 1): S42-S43.

symposium on the economic and environmental feasibility of treating forest land with municipal sewage effluent and sludge. The program was the third put together by members of the Water Quality Working Group.¹

Other working groups were just as busy. David Miller, a University of Connecticut scientist with the Amenities Working Group, reported that 10-20 percent of the heat produced on a parking lot could be transferred to, and dissipated in, adjacent forests.² Over at Amherst, Julius Fabos published a second volume from the Metropolitan Landscape Planning Model (METLAND) study, this time on the special planning requirements of critical and sensitive landscapes.³ These and other studies ensured that by 1978, the Consortium program was undoubtedly at the forefront of urban forestry research. In just seven years, it had funded more than one hundred proposals, including eight major symposia, for a total of over \$1,250,000. More significantly, many of the projects had generated valuable new information for practitioners and scientists alike.

It came as no surprise, then, when the NEFES invited the Consortium to organize and sponsor the first National Urban Forestry Conference. Some 450 professionals descended on Washington, D.C. to attend the first comprehensive gathering of urban forestry managers, educators, and scientists under one roof.⁴ It was another significant step in the Consortium's effort to unify what had once been a most disjointed branch of forestry, and a final-day evaluation that revealed almost unanimous support for the conference clearly demonstrated that the Consortium was succeeding.

Conferences helped promote the Consortium among a substantial and diverse audience. But most scientists continued with the tried and tested journals as outlets for their work. In The Appraisal Journal, for example, Peter Pizor, a member of the Planning and Management Working Group from Rutgers University, discussed transfer of development rights (TDR), a land use tool that attempts to balance urban growth with environmental preservation.⁵ David DeWalle from Pennsylvania State University reported in Science in Agriculture that woodlands could produce significant energy savings in home energy heating costs,⁶ while the Journal of Arboriculture published the initial findings of a comprehensive study by the Cary Arboretum's David Karnosky into air pollution tolerances of trees commonly planted in urban areas.⁷

It was also in 1978 that the Executive Committee decided to abandon problem analyses. The latter tended to become "carved in stone" and failed to accommodate frequent changes in working group membership, audience needs, or societal needs. They were replaced by five-year "rolling" research plans, with annual revisions as necessary, that allowed a more flexible research schedule responsive to change while maintaining a degree of continuity. The Amenities Working Group had pioneered this idea, being the only group to employ rolling plans right from the start.⁸

The most significant decision made by the Executive Committee in 1978, though, was the creation of a sixth official to be known as the Executive Secretary. Essentially a program manager for the Consortium, the Executive Secretary would provide better coordination within a rapidly growing organization. By having someone handle administration of the proposal review process, organization of meetings, and coordination of working group activities, the other Executive Committee members could concentrate on policy matters. In particular, the Executive Secretary allowed the Station's Program Coordinator to evolve from a combined management/executive function to more of the latter only. In a move that facilitated successful transition of Executive Secretary duties from Forest Service personnel in the Program Coordinator's position to university faculty, Lee Herrington from SUNY CESF served as the first Executive Secretary through an Intergovernmental Personnel Agreement (IPA) with the Forest Service that added him to the staff of the NEFES for a year.

¹Sopper, W.E. and S.N. Kerr (eds.). 1978. *Proc. Symp. on Utilization of Municipal Sewage Effluent and Sludge on Forest and Disturbed Land*. Pennsylvania State University Press, University Park, PA. 560pp.

²Miller, D.R. 1977. Structure of the Microclimate at a Woodland/Parking Lot Interface. In: *Northeastern Forest Experiment Station, Proc. Conf. on Metropolitan Physical Environment*. USDA Forest Service Gen. Tech. Rep. NE-25. NE. For. Exp. Sta., Broomall, PA: 109-114.

³Fabos, J.G. 1977. *Composite Landscape Assessment: Assessment Procedures for Special Resources, Hazards and Development Suitability. Part II. METLAND Research Bulletin 637*. Mass. Agr. Exp. Sta., Amherst, MA. 323pp.

⁴Payne, B.R. and J.E. Gallaher. 1979. *National Urban Forestry Conference*. *J. For.*, 77 (5): 284-286; Hopkins, G. (ed.). 1980. *Proc. First National Conf. on Urban Forestry*. Washington, D.C. USDA Forest Service and SUNY College of Environmental Science and Forestry, Syracuse, NY. ESF publ. 80-003. 2 vol. 874pp.

⁵Pizor, P.J. 1978. A Review of Transfer of Development Rights. *The Appraisal Journal*, XLVI (3): 386-396.

⁶DeWalle, D.R. 1978. Mobile Home Energy Costs Conserved with Shade Trees. *Science in Agriculture*, 26 (1): 16.

⁷Karnosky, D.F. 1978. Testing the Air Pollution Tolerances of Shade Tree Cultivars. *Journal of Arboriculture*, 4 (5): 107-110.

⁸Forest Amenities Working Group. 1973. *Forest Amenities: Research Program of the Forest Amenities Working Group*. USDA Forest Service, NE. For. Exp. Sta., Broomall, PA. 181pp. (unpublished)

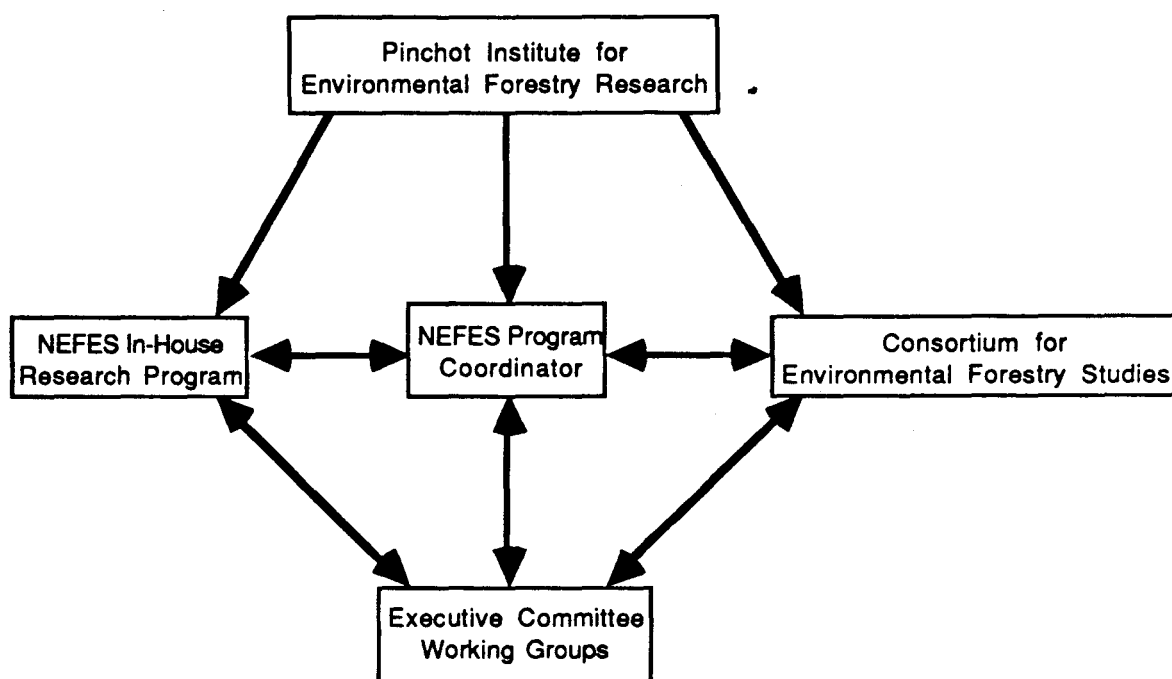


FIGURE TWO: The Pinchot Institute for Environmental Forestry Research

The same year also saw changes of a more physical nature. In the fall, the NEFES' research unit in Pennington, NJ, moved to the Pennsylvania State University campus in University Park, PA. More significantly, the Station received an appropriation for a third urban forestry research unit, to be based this time in Syracuse, NY. Scientists there embarked upon a series of studies in ecology and management, and also examined ways to effect technology transfer between the Pinchot Institute's research program and city management.

The various revisions and additions to the Institute format assured steady growth and improvement within the program (see FIGURE TWO). Working group meetings continued to be held at least once a year, and preferably every six months, where members would discuss ongoing research and plan future projects. Proposals conforming to working group five-year plans were submitted by both member and non-member scientists. Unlike their member counterparts, however, "guest" scientists were not reimbursed for Consortium-related travel expenses, though they were allowed to become active on a regular basis. Proposals from non-member institutions were also subject to a \$10,000 funding limit, though this could be avoided if the scientist chose to join a Working Group instead.¹ While the policy presumably restricted research contributions from non-member institutions, it did ensure that the Consortium maintained a sound and logical research program instead of returning to the random proposal submissions of the early years.

As the NEFES prepared to fund another sixteen proposals in 1979, other projects were approaching completion. Among these was a study by Ronald Harkov and Eileen Brennan, who argued that slower growing trees may be best suited for planting in urban areas plagued by air pollution problems.² A Genetics Working Group project revealed that differences among families in one kind of foliar injury may not necessarily parallel those in another kind of foliar injury, leading the scientists to believe that total foliar injury may be a complex

¹Scientists from non-member institutions were encouraged to lobby their university administrations to join the Consortium, since increased membership brought additional physical plant and other resources into the research effort.

²Harkov, R. and E. Brennan. 1979. An Ecophysiological Analysis of the Response of Trees to Oxidant Pollution. *Journal of the Air Pollution Control Association*, 29 (2): 157-161.

of genetically independent symptom responses. In another interesting but unrelated study headed by William Sopper, wasteheat and wastewater applied to a hybrid poplar plantation produced significant increases in average basal diameter and height growth without any significant effect on survival rates.¹

There came one final change during this very productive maturing period. In 1977, the universities handed over the Pinchot name to the Forest Service program at Grey Towers, Gifford Pinchot's old estate in Milford, Pennsylvania, which had recently been expanded into a communication and education center known as the Pinchot Institute for Conservation Studies (PICS). The Consortium and NEFES became part of the Urban Forest Research Program. Most audiences knew of the former Pinchot Institute for Environmental Forestry Studies through the Consortium, and so few practitioners or researchers were ever even aware of the title change. As far as they were concerned, the Consortium was running along as smoothly as ever.

¹Sopper, W.E., D.R. DeWalle and S.N. Kerr. 1979. Utilization of Municipal Wastewater and Waste Heat for Energy Production From Forest Biomass. In: Proc. Symp. Technology for Energy Conservation. Information Transfer Inc., Rockville, MD: 572-581.

THE FINAL YEARS (1980-86):

Although the Consortium celebrated its tenth birthday with the addition of three new members — the University of Delaware, Ohio State University, and the University of Vermont¹ — NEFES staff were unable to share the mood of optimism. Federal research funds for urban forestry and recreation had declined over the previous couple of years, and Congress had also begun "earmarking" certain Forest Service research allocations for specific areas of study, thereby reducing overall spending flexibility. The NEFES was forced to make cutbacks. Although it could absorb the early reductions internally, additional cuts forced the Station to consider other ways of saving money. Extra-mural research was an obvious target, for the NEFES naturally gave top priority to its internal programs. But it did not want to drop something as productive as the Consortium, and instead suggested for a second time that the universities consider alternative sources of funding.

The idea did merit further discussion by some Executive Committee members who had noticed, for example, the diminishing travel funds. But it was difficult for them to generate any kind of consensus support. The Consortium research program had brought it to the very forefront of urban forestry, and in turn, had recently attracted membership applications from several universities who were among a larger group attempting to expand their traditional emphasis on teaching into more research-oriented activities. Alternative funding was undoubtedly necessary to safeguard the future, but the current situation hardly seemed to merit significant change, especially when any such move would require time and resources that university professors simply did not have.

Despite its own warnings, the sense of *laissez faire* was just as prevalent at the NEFES. Funding for the 1981 proposals, for example, remained identical to the previous year. Director Denver Burns, however, did respond to an internal management review at the Station that called for better accounting of Consortium funds and outputs. He assigned each Consortium grant a NEFES Project Leader, normally one of the Station's in-house scientists who was familiar with the proposed area of study. Principal investigators were expected to provide their project leaders with annual reports, final reports, and copies of any publications. Without these reports, the latter could refuse to sign invoices on Consortium grants. An additional three copies of the reports were to be made for the Executive Secretary, and one for the appropriate working group chairperson.

Previously, the Executive Secretary had approved all expenditures on Consortium grants. But it was hoped that the new format would not only provide better fiscal and technical monitoring but also encourage even closer cooperation between the Station's research units and university scientists, since many of the NEFES Project Leaders were also members of the working groups.

Consortium research, meanwhile, continued at the same pace. A team from the Air Quality Working Group found that although typical obstacles such as poor soils and drought may lead to nutritional and water stress problems for trees, such conditions can also suppress their sensitivity to ozone damage.² Looking specifically at soils was University of Massachusetts scientist Donald Mader, who examined the advantages of a composite sampling scheme for both physical and chemical soil property estimates.³ The Social and Behavioral Issues Working Group was moving along in the social sciences, publishing one report about the effects of congestion on the demand for forest-oriented outdoor recreation.⁴ In another study funded by the group, Jeff Hayward from the University of Massachusetts developed some information brochures to improve user perceptions and awareness of local parks which had previously been under-utilized by nearby communities.⁵

But attention turned once again to the problem of finances when 1982 brought further federal cutbacks for the NEFES. These were inevitably passed on to the Consortium, which was hit with a one-third reduction in its grant allocation. In just three years, the number of successful proposals had gone from sixteen to eight, despite continued growth in the number of submissions. At the Consortium's annual meeting that year, Burns also repeated an earlier warning from his deputy Robert Romancier that the NEFES could no longer guarantee continuation of previous funding amounts, nor how much longer funding would last.

Ironically, 1982 also brought one of the Consortium's most notable technology transfer achievements. The Soils Working Group, realizing that urban soil problems were more the product of an inability to disseminate information among practitioners than of a lack of research, put together a intensive workshop

¹Princeton University's recent resignation brought the total number of Consortium members to eleven.

²Harkov, R. and E. Brennan. 1980. The Influence of Soil Fertility and Water Stress on the Ozone Response of Hybrid Poplar Trees. *Phytopathology*, 70 (10): 991-994.

³Ruark, G.A. and D.L. Mader. 1981. A Composite Sampling Scheme for Urban Soils Under Roadside Trees. *Agron. Abs.* 1981 Ann. Meeting: 230.

⁴Ross, A.D., T.M. Stevens and P.G. Allen. 1981. Measurement of Recreation Benefits for Urban-Oriented Camping. *Research Bull.* No. 667. Mass. Ag. Exp. Sta., Amherst, MA. 63pp.

⁵Hayward, D.G. 1981. When You Think of Forest Park...Info. Brochure. University of Massachusetts, Amherst, MA. 4pp.; 1981. When You Think of Green Hill Park...Info. Brochure. University of Massachusetts, Amherst, MA. 4pp.

program sponsored by the Consortium with some additional funds from the National Park Service. A total of eight were held around the country, attracting over 500 practitioners. In addition, Phillip Craul of SUNY CESF developed a handbook for the participants that is still the only real attempt to summarize urban soils in one volume, and which has been so popular that it has required two more reprints.¹

Another technology transfer tool for the Consortium was the Urban Foresters Notebook.² Started by the NEFES at the 1978 National Urban Forestry Conference, the Notebook was originally intended as a dissemination vehicle for Forest Service scientists. In 1982, the Station invited the Consortium to take over operation of the Notebook, suggesting that it become their main technology transfer arm. They were prepared to allocate an additional \$15,000 if the Consortium would use \$10,000 from its own budget. The \$25,000 total would support a half-time editor and produce at least six Notebook supplements per year. The Consortium accepted in May 1982, and by 1983, the first two supplements had been approved. Unfortunately, there were only four more supplements published after that, because financial worries continued to hinder the Consortium. Program Coordinator Albert Foulger had just announced at an Executive Committee meeting in January 1983 that due to reductions in federal funding, NEFES support for the Consortium would decrease over the next 2-3 years, and terminate in 4-5 years.

The Consortium was finally spurred into action. Alternate structures and sources of financial support were discussed over the next few months, and the result was a new charter and by-laws, effective as of 1 July 1983 (see APPENDIX TWO). The responsibilities of President, Secretary-Treasurer, Executive Secretary, and First Vice-President remained unaltered, though the latter was renamed simply Vice-President. More notable was the removal of Vice-President for Research, who had been responsible for the screening of proposals. Instead, the Executive Committee gained a Member-at-Large, whose charge was simply to oversee Consortium fund-raising activities and, when requested, assist the President. This left no one available for the constant evaluation and upgrading of proposal review procedures that any large research organization needed to keep itself effective and efficient.

The sudden concern with fund-raising was also reflected in the expansion of Consortium membership requirements to allow the inclusion of new institutions. NEFES would remain the sole Founding Sponsor, and for the time being, continue to provide almost all the Consortium budget. All other institutions now became either a Participating or Sponsoring Member. Participating Members included arboreta, botanical gardens, educational centers, professional societies, research centers, and universities. Typical Sponsoring Members would be private corporations, utility companies, chambers of commerce, and government agencies. Irrespective of type, each Member cast one vote for all elected positions on the Executive Committee. Furthermore, they each contributed an annual fee of \$500, which was used to solicit additional funds from outside.³

The universities were placing a great deal of hope on their hunt for outside sponsors. They knew that Consortium activities had created a wealth of research results and expertise that could be effectively marketed to users. But any fund-raising search could not be undertaken with Forest Service monies, hence the \$500 fee. Furthermore, as a public agency, the Forest Service and anything it financed was strictly prohibited from lobbying for research appropriations.⁴

The revised charter also authorized the creation of a new Advisory Board to identify critical research needs. Now that the Consortium was actively seeking external funding, its research program had to be more attractive to 'outsiders'. Current areas of study might not interest some sponsors, and so it became even more important that the universities examine other fields of potential activity related to urban forestry. A broader representation might increase their chances of identifying the 'hot' issues and concerns of the time, and so the Executive Committee approached some practitioners with no prior affiliation with the Consortium who might be willing to sit on the Advisory Board.

They also began looking for a new Executive Director. It was becoming impossible for the Executive Secretary to combine his professional career with Consortium responsibilities, which had expanded beyond the means of a single part-time officer. So a search was initiated for a permanent full-time Executive Director. The

¹Craul, P.J. (ed.). 1982. *Urban Forest Soils: A Reference Workbook*. USDA Forest Service, SUNY College of Environmental Science and Forestry, Syracuse, NY, and USDI National Park Service. 185pp.

²Little, S. (ed.). 1978. *Urban Foresters Notebook*. USDA Forest Service Gen. Tech. Rep. NE-49. NE. For. Exp. Sta., Broomall, PA.

³A membership fee had first been recommended to the Consortium following discussions at an ad hoc meeting of the Executive Committee and working group chairmen in December 1976. President Thomas reiterated that recommendation in his 1978 annual report but the proposed charter amendment was eventually defeated by one vote. Though the close result certainly indicated interest for the idea, it took another five years before the idea finally became policy.

⁴The original thinking behind the Problem Analyses was that they would be marketed to major granting institutions for sponsorship. But until the Consortium managed to fund a full-time permanent position to perform that function, the idea would never materialize.

new post called for somebody with a variety of skills, for their mandate was not only to take over current responsibilities of the Executive Secretary but also to manage fund-raising activities.

The idea of an Executive Director was not universally accepted by the universities. Some argued that if they each contributed \$10,000 toward his/her salary, and he/she then won a grant for scientists at Pennsylvania State University, for example, the ten remaining members would have nothing to show for their \$10,000 investment. Though the argument was far removed from the sense of cooperation that had blessed the Consortium thus far, it did carry weight in some quarters. The universities therefore compromised, and instead of funding an Executive Director themselves, searched for external grants to finance the position.

Outside sponsorship was not the only route for the Consortium. While drawing up the new charter, the Executive Committee had investigated the legal measures required for the Consortium to obtain tax exempt status. But the idea was dropped when it became clear that such a move would involve too much red tape and bureaucracy, the very things the Consortium had tried to avoid throughout its history.

1984 brought only six grants for the Consortium. By October, the situation had become so bad that even the simplest of administrative tasks were suffering from money shortages. The Executive Committee had little choice but to give top priority to the Executive Director's position which, like the Advisory Board, had still not been filled. They announced that because there were insufficient monies to support both an executive director and research, there would be no funding available for 1985 proposals. Furthermore, there would be a one-year delay in the payment of membership dues. It would have been unfair to request the \$500 fee when the universities were not receiving any grants in return.

As the Consortium moved into 1985, it was clear that the universities would have to manage with \$50,000 for the year, less than half of the 1984 total (\$136,540). A meeting of Executive Committee members and working group chairmen was held in February 1985 to discuss the future. They came to the conclusion that three target areas offered the greatest opportunity for attracting outside funds: potable water, street trees and urban vegetation, and recreational impact on forests and related resources. As a result, the 1985 annual meeting in June was centered around presentations on these three topics.

But time had run out for the Consortium. Leadership had evaporated, and the unity gone. Scientists had turned to other more lucrative areas of research in an effort to win new grants, while further budgetary cuts had left the NEFES with internal difficulties of its own. By the end of 1985, the Consortium had simply ceased to function, leaving behind a record of fourteen years of outstanding research that had brought along urban forestry in leaps and bounds, forged a strong sense of *esprit de corps* among scientists, and inspired professional and institutional cooperation throughout the Northeast. Finally, on 17 February 1986, the NEFES officially withdrew its financial support from the Consortium for Environmental Forestry Studies.¹

¹NEFES Director Denver Burns informed Robert Bond, President of the Consortium, of the Station's decision to withdraw financial support in a letter written 13 December 1985.

THE WORKING GROUPS

Even though the Pinchot name was eventually lost, the philosophy of "breaking new ground" stayed with the Consortium from its earliest days. And the philosophy did not just apply to areas of research. New management structures were needed if the Forest Service and universities were to successfully pioneer the field of urban forestry. In particular, the two sides had felt that their goals might best be achieved with a bottom-up style of operation that facilitated input from a relatively large pool of scientists and thus encouraged a research program with greater potential for new directions and innovative ideas.

So the working groups quickly became the heart and soul of the Consortium. Each was kept small and specific to prevent duplication of research efforts, and to facilitate coordination and packaging of research proposals. Initially, they also had absolute control over their research programs, which were limited by each group's approved mission, and the subject areas of its member scientists. Proposals were based upon the working group's perceptions of the needs of either practitioners, or of other scientists. At this stage in the Consortium's development, the user had no formal involvement in the working group's research planning.

On the other hand, the three NEFES research units could become involved in working group proposals through one of two ways — a Station scientist could initiate a project that included other institutional researchers, or institutional researchers could invite one or more of their Forest Service counterparts to join them in a proposal. The NEFES preferred the latter in most cases. It wanted the universities to have as much control over their research direction as possible, and a proposal from a Station scientist might be construed as an attempt to exert influence.¹ Either way, though, Consortium grants would always be awarded to the institutional researcher. NEFES scientists were already receiving Forest Service research funds as part of their daily work.

Two factors forced the working groups to drop their monopoly on the development of research programs. As the Consortium matured, it expanded its lines of communication among practitioners so as to ensure that research agendas were more geared to the needs of the latter. Secondly, attempts to market the Consortium to outside agencies forced the members to make their programs more relevant to the issues and needs of the time. Both trends were instrumental in the gradual inclusion of independent consultants. Bearing in mind the desire for a bottom-up style of operation, this practice merely served to improve the Consortium's ability to break new ground in urban forestry.

Those carrying the greatest influence within the working groups, however, were the chairpersons. They were responsible for requesting research proposals, screening proposal outlines, preparing proposal packages that also included an annual report,² and generally disseminating information between the Executive Committee and working group scientists. Initially, they were elected from among the members of the working group. A by-law adopted in December 1978 revised this process by requiring the Executive Committee to appoint chairpersons. The by-law also set a limit of two years for each term of office. This was again revised in 1982, with chairpersons now being nominated by the institutional representatives, and then appointed by the Executive Committee.

Leadership styles varied among the chairpersons, with three patterns showing most strongly. Some individuals may have seen the working groups as an opportunity to make a name for themselves, and thus played a very dominant role in how research was conducted. Others preferred to delegate responsibilities among each scientist. They operated as just another working group member, only asserting themselves as leaders when necessary. The third and final category consisted of chairpersons who acted solely as linking agents and fundraisers. Research was left to the working group scientists, and the chairperson concentrated on coordinating the various projects and ensuring effective communication and dissemination both within and between each team. Experience showed the latter two to be the most productive types of leadership, and so it appears that the Consortium was correct in its desire for a bottom-up system of operation. Overly-dominant leaders merely restricted the creative abilities of other scientists.

Other factors affected working group performance. Strong links between practitioners and scientists had already been established in some areas of urban forestry research. A working group conducting research in these particular disciplines would often contain scientists affiliated with a whole string of related professional organizations. These researchers saw the Consortium as just another outlet, rather than as a pioneering outfit

¹ Indicative of the NEFES's determination to let the Consortium run independently was the fact that although the Station Director reserved the right to veto any proposal, only once was that right exercised.

² All chairpersons were responsible for preparing and submitting an annual report in conjunction with the submission of proposals by working group scientists. The annual report consisted of a summary of working group achievements, a research plan, and an introduction to the next set of submitted proposals.

bringing together the field for the first time to explore new avenues of research; hence the working group never quite had the drive or camaraderie of others hungry to establish themselves. But leadership was still a key component here. The arrival of new blood sparked the reemergence of at least two working groups after it seemed that scientists had given up and moved on elsewhere.

Much more difficult to rectify was the problem of inter-disciplinary versus multi-disciplinary research. Though urban forestry is assuredly inter-disciplinary, the working group structure adopted by the Consortium was not. Indeed, dividing urban forestry into nine separate disciplines actually served to promote multi-disciplinary research, and likewise with the three NEFES research units and their particular missions. It is a difficult problem to resolve, if, indeed, it can be. Any effort to bring scientists together on a series of truly inter-disciplinary projects lays itself open to all kinds of personal, managerial, and professional headaches. One possibility for the Consortium might have been a single inter-disciplinary Problem Analysis, which would have then provided an overall basis for all working group research priorities. A second alternative might have been another management tier lying between the Executive Committee and working groups, made up of representatives from the various disciplines. These representatives would attempt to merge the research results of each working group into one inter-disciplinary product. They would also ensure that future research in their fields of expertise was closely aligned with the Consortium's overall inter-disciplinary goal. As things stood, the working group chairpersons appeared to be the most suitable candidates for that job.

In general, though, the working group structure succeeded very well. After research, their most notable contribution was improved communication. Scientists from the NEFES and universities gained a better understanding of their respective *modus operandi* through meetings, preparation of proposal packages, and collaboration on joint projects. This, in turn, gave each side improved sensitivity for their respective strengths and weaknesses, research priorities, and so on. Regular meetings with researchers from other disciplines yielded a broader perspective of urban forestry, as well as an appreciation for the wider implications of their own results in other seemingly unrelated fields of study. Wildlife faculty, for example, might have been interested in the work of the Social and Behavioral Issues group on urbanite perceptions when considering how to promote wildlife conservation in the suburban garden.

It is impossible to estimate the worth of these improved lines of communication but that they were important is undeniable. Professional and personal friendships have long outlasted the Consortium, and even today, former members regularly consult with each other.

Before looking at the particular interests of each working group, it is worth noting that the Pinchot Institute was not the only organization to enjoy the benefits of a consortium format. Some years after the universities had joined forces with the NEFES, Warren Doolittle moved on to Washington, where he became involved with the Man and the Biosphere Program (MAB).¹ It was not long before MAB boasted a consortium of its own that went on to support superior research in international and global forestry concerns.

The following paragraphs summarize the main areas of interest of each working group. Further details can be found in APPENDIX EIGHT.

¹Unesco Report of the Director-General 1975-76. Unesco: 23-24. MAB was launched by Unesco in 1970 as a framework for international cooperation in the research and development of sustainable land-use projects for developing nations. The Forest service took the lead in establishing a consortium of federal agencies to generate funds for MAB, with the donors contributing money toward research by directorates in tropical forestry, wildlife, biosphere reserves, and urban forestry among others. In the United States, for example, the Forest Service, Fish and Wildlife Service, National Park Service, and Environmental Protection Agency were the main contributors. Each directorate, which was made up of individuals, universities, agencies, and other interested parties, was headed by a chairperson who would submit proposals on their behalf to a review committee. The latter would then rank the proposals and submit the list to the MAB head office. Donors could stipulate which areas of research they wished to fund, while the MAB officers made decisions regarding grants to specific proposals. The MAB program had a number of similarities with the Consortium, not least of which was its method of funding, management structure, proposal review process, and limited overheads.

Air Quality Working Group - formed 1973

Mission: improving understanding of the effects of air pollution on trees and the effects of trees on air quality.

Air quality is especially critical in metropolitan areas because of the tremendous aggregation of people, motor vehicles, industries, and refineries. Though the primary objective must always be to reduce air pollution at the source, vegetation can be used to abate air pollution effects as well.¹ The Air Quality Working Group examined ways in which plants can provide a major filtration and reaction surface that acts to trap particulates,² as well as how they remove a number of different gases through absorption. Scientists also studied the impact of air pollution on urban trees.³ Priority goals as presented in their Problem Analysis were:

- Dose response information on visible (symptomatic) response with experiments appropriately designed to consider the influence of genetic factors, environmental factors and interaction of air contaminants.
- Analysis of the ability of air pollution stress to predispose or aggravate stresses caused by insect, microbial, or abiotic stresses.
- Determine the ability of woody plants to reduce atmospheric contamination.
- Determine the usefulness of resistant (tolerant) varieties in reducing air pollution stress of trees.

Twenty research proposals were successfully submitted by the Air Quality Working Group. Scientists published important information about such gaseous and particulate pollutants as fluorine, chlorine, ozone, salt spray, cement dust, heavy metals, and acid rain that not only appeared in numerous journal articles and symposium papers, but which was also used to help formulate EPA Air Quality Criteria.⁴

Researchers at Cornell University found that species with higher stomatal conductances exhibited greater negative responses to ozone than those with low stomatal conductance because of their higher potential for pollutant uptake.⁵ Factors such as poor soils and drought were also shown to suppress sensitivity to ozone,⁶ while data from a recent study of eastern white pine has contradicted the widely held view that this very common species is sensitive to ozone pollution.⁷

Members of the Air Quality Working Group initiated a number of joint projects with their counterparts in the Genetics Working Group, and vice versa. In particular, they investigated the role of genetics in the relative resistance of tree species to various air pollutants, and were able to identify some of the more resistant species through this work.⁸ These projects were probably more interdisciplinary in nature than any other Consortium activities excluding the symposia, and showed just what could be achieved if scientists from different fields made a real effort to work together.

¹Smith, W.H. and L.S. Dochinger (eds.). 1975. *A Problem Analysis for Environmental Forestry Research: Air Pollution and Metropolitan Woody Vegetation*. Yale University Printing Service, New Haven, CT. 74pp.

²Smith, W.H. 1977. Removal of Atmospheric Particulates by Urban Vegetation: Implications for Human and Vegetative Health. *Yale Journal of Biology and Medicine*, 50: 185-191.

³Rhoads, A.F. and E. Brennan. 1975. Flouride Damage to Woody Vegetation in New Jersey in 1974. *Plant Disease Reporter*, 59 (5): 427-429.

⁴US Environmental Protection Agency. 1986. *Air Quality Criteria for Ozone and Other Photo-Chemical Oxidants*. EPA/600/8-84. USEPA, Research Triangle Park, NC. Vol. 3.

⁵Reich, P.B. and R.G. Amundson. 1985. Ambient Levels of Ozone Reduce Net Photo-Synthesis in Tree and Crop Species. *Science*, 230 (4725): 566-570.

⁶Harkov, R. and E. Brennan. 1980. The Influence of Soil Fertility and Water Stress on the Ozone Response of Hybrid Poplar Trees. *Phytopathology*, 70 (10): 991-994.

⁷Eberhardt, J.C., E. Brennan, J. Kuser and R. Harkov. 1988. Ozone Tolerance in New Jersey Field-Grown Eastern White Pine. *Journal of Arboriculture*, 14 (8): 185-192.

⁸Karnosky, D.F. and D.B. Houston. 1978. Genetics of Air Pollution Tolerance of Trees in the Northeastern United States. In: *Proc. NE. For. Tree Improv. Conf.*, 26: 161-178; Karnosky, D.F. and K.C. Steiner. 1981. Provenance and Family Variation in Response of *Fraxinus americana* and *F. pennsylvanica* to Ozone and Sulfur Dioxide. *Phytopathology*, 71 (8): 804-807; Karnosky, D.F. and T.R. Myers. 1982. Pollution: New Factor in Diagnosis of Tree Damage. *Weeds, Trees, and Turf*, 21 (2); Specify Tolerant Trees for Air Polluted Areas. *Weeds, Trees, and Turf*, 21 (3): 56-62.

Amenities Working Group - formed 1973

Mission: improving knowledge about the amenity value of trees. Specifically, 1) human and plant biometeorology, 2) energy conservation, 3) noise, and 4) air quality.

Trees planted along avenues, in gardens, and on rooftops all help to make urban life that little bit more comfortable, offering shade and softening the harsh angles of the cityscape to provide a more aesthetic setting. They have physical amenity value, which the Forest Amenities Working Group defined as the "contribution of urban forest vegetation toward man's well-being, comfort, and pleasant life".¹ Of the many different amenity functions served by urban trees, working group scientists chose to concentrate on three:

- to characterize and evaluate important effects of vegetation on man's physical environment and well being in outdoor metropolitan areas.
- to characterize and evaluate important effects of vegetation on energy conservation.
- to integrate the physical effect of vegetation with aesthetic landscape design and minimum maintenance vegetation ecosystems so that an effective technology transfer between scientists and urban planners, designers, and managers is obtained.

The Amenities Working Group won Consortium grants for thirty proposals, looking primarily at meteorology, energy conservation, and/or acoustics. Scientists at Pennsylvania State University showed how urban forests can significantly reduce home energy costs throughout the year. Trees lower heat amounts lost to air infiltration in winter by sheltering houses from the wind, while forest shade in summer decreases the amount of sunlight absorbed on the outer surfaces of homes, thereby lowering air conditioning needs.² David Miller from the University of Connecticut also found that forests can dissipate as much as 10-20 percent of the heat produced on adjacent parking lots.³

Other studies by Gerhard Reethof and Gordon Heisler of the NEFES showed how urban vegetation, and woody matter in particular, can dissipate sound by at least 6-8 decibels for every hundred feet of forest. The trunks and branches scatter the sound, which is then absorbed by the forest floor.⁴ However, trees planted in narrow bands are not nearly so effective and, unless used in conjunction with terrain features and urban structures, are not very feasible mechanisms for noise reduction in urban areas with limited space for small forests. Lee Herrington from SUNY CESF suggested that suburban locations appear to offer the best potential for noise abatement through large tree plantings.⁵

Amenities Working Group scientists were closely involved in the program development for two conferences — a 1975 symposia on the use of urban vegetation, space, and structures to improve physical amenities, and the much larger 1978 National Conference on Urban Forestry.⁶ Their grants also supported eleven graduate degree candidates.⁷

¹Forest Amenities Working Group. 1973. *Forest Amenities: Research Program of the Forest Amenities Working Group*. USDA Forest Service, NE. For. Exp. Sta., Broomall, PA. 181pp. (unpublished)

²DeWalle, D.R. and E.P. Farrand. 1978. *Windbreaks and Shade Trees — Their Use in Home Energy Conservation*. Pennsylvania State University Agr. Ext. Ser., Special Circular 245. University Park, PA. 8pp.

³Miller, D.R. 1977. *Structure of the Microclimate at a Woodland/Parking Lot Interface*. In: *Northeastern Forest Experiment Station, Proc. Conf. on Metropolitan Physical Environment*. USDA Forest Service Gen. Tech. Rep. NE-25. NE. For. Exp. Sta., Broomall, PA: 109-114.

⁴Reethof, G. and G.M. Heisler. 1976. *Trees and Forests for Noise Abatement and Visual Screening*. In: F.S. Santamour, Jr., H.D. Gerhold and S. Little (eds.), *Better Trees for Metropolitan Landscapes: Symposium Proceedings*. USDA Forest Service Gen. Tech. Rep. NE-22. NE. For. Exp. Sta., Broomall, PA: 39-48.

⁵Herrington, L.P. 1974. *Trees and Acoustics in Urban Areas*. *Journal of Forestry*, 72 (8): 462-465.

⁶Northeastern Forest Experiment Station. 1977. *Proc. Conf. on Metropolitan Physical Environment*. USDA Forest Service Gen. Tech. Rep. NE-25. NE. For. Exp. Sta., Broomall, PA. 447pp.; Hopkins, G. (ed.). 1980. *Proc. First National Conf. on Urban Forestry*. Washington, D.C. USDA Forest Service and SUNY College of Environmental Science and Forestry, Syracuse, NY. ESF publ. 80-003. 2 vol. 874pp.

⁷Vittum, J. 1974. *The Physical Structure of City Space and Its Affect on Micro-Climate and Human Thermal Comfort*. M.S. Thesis. SUNY College of Environmental Science and Forestry, Syracuse, NY. 253pp.; Plumley, H.J. 1975. *The Design of Outdoor Urban Spaces for Thermal Comfort*. M.L.A. Thesis. SUNY College Of Environmental Science and Forestry, Syracuse, NY. 206pp.

Genetics - formed 1973

Mission: genetic improvement of intensively-used urban forest vegetation.

The urban environment is particularly stressful for trees. Cramped growing space, inadequate water, soil compaction, and temperature extremes are just a few of the many hazards encountered in city locations, and developing trees to withstand this onslaught was the mandate of the Genetics Working Group, who set out:¹

- to develop and disseminate genetic information about urban trees for managerial purposes, and
- to select, breed, propagate, and release for use trees that are genetically superior for urban environments of the Northeast.

While producing new knowledge was common to all working groups, the second objective of producing new trees was unique to the Genetics team. They considered this essential, because the successful application of knowledge contributed by other working groups ultimately depended on the availability of trees that were well adapted to urban environments and uses. Directly or indirectly, trees were involved in nearly every component of the services, locales, technology, and environmental effects included in the wide array of Consortium research interests.

More specifically, genetic improvements in planted trees were considered one of the more valuable and long lasting contributions offered to urban inhabitants by the Consortium. Many of its research applications depended on manipulating trees whose benefits would remain for many decades. It was essential that these trees be well adapted biologically, functionally, and aesthetically for whatever purpose they were planted.

Projects undertaken by the Genetics Working Group ranged from very comprehensive to specific. David Karnosky from the Cary Arboretum in New York used one of his three Consortium grants to conduct a large study of common city tree species and their relative sensitivities to sulfur dioxide and ozone. Comparing chamber test results with field observations, he found that among the most resistant were several maple cultivars, European ash, European beech, ginkgo, and white ash cultivars, while the more sensitive London plane tree and cultivars of common honeylocust offered potential as bioindicators of the presence of ozone.²

Kim Steiner from Pennsylvania State University headed a small investigation of iron chlorosis resistance in pin oak, a popular ornamental tree. His results showed a weak but definite geographic pattern, with populations from northcentral and northwestern parts of the species' range consistently among those most resistant to chlorosis.³ Another group of scientists at Ohio State University focused on the problem of tree injuries by testing various growth regulators and their effect on wound closure.⁴

Scientists, however, did not neglect their first objective, that of dissemination. Henry Gerhold from Pennsylvania State University developed a 'genetic information system', using data collected through a survey of municipal arborists, nurserymen, and other professionals. This facilitated the selection and breeding of trees for specific uses and conditions,⁵ and was later used in the Municipal Tree Restoration Program.⁶

One outgrowth of the Genetics Working Group was METRIA, the Metropolitan Tree Improvement Alliance. Formed in 1973, METRIA is a coalition of nurserymen, arborists, landscape planners, tree breeders, and

¹Gerhold, H.D., K.C. Steiner, F.C. Cech and D.F. Karnosky. 1982. A Problem Analysis for Environmental Forestry Research: Genetic Improvement and Urban Trees. US Govt. Print. Off. 65pp.

²Karnosky, D.F. 1981. Chamber and Field Evaluations of Air Pollution Tolerances of Urban Trees. *Journal of Arboriculture*, 7 (4): 99-105.

³Berrang, P. and K.C. Steiner. 1980. Resistance of Pin Oak Progenies to Iron Chlorosis. *Journal of the American Society of Horticultural Science*, 105 (4): 519-522..

⁴Gallagher, P. and T.D. Sydnor. 1983. Promotion of Wound Closure in Shade Trees With Exogenously Applied Growth Regulators. *Journal of Arboriculture*, 9 (9): 229-232.

⁵Gerhold, H.D. 1985. Performance Testing of Street Tree Cultivars: A Model Project. *Journal of Arboriculture*, 11 (9): 263-271.

⁶Initiated in 1987, the Municipal Tree Restoration Program is another effort to disseminate research results among a wider audience. It includes representatives from Pennsylvania State University (notably Henry Gerhold, a former chairman of the Genetics Working Group), the Pennsylvania Bureau of Forestry, and the Pennsylvania Electric Company (Penelec). Various utility companies, including Penelec, became so interested in the urban forestry work of the researchers that they donated grants toward the restoration and preservation of urban trees. A research component has also been funded. The program illustrates once again how an initial interest in technology transfer can be transformed into a self-perpetuating fund-raiser such that technology transfer can support itself, and even contribute funds to further research. Researchers at Pennsylvania State University, where the program is based, suggest that work they did with the Consortium was instrumental in getting the original program off the ground.

other urban tree specialists that serves as a vehicle for technology transfer and communication.¹ Another spin-off was the development of a program between the United States and Holland to promote international exchange of urban tree cultivars and related technical data.²

¹Gerhold, H.D. 1978. History and Goals of METRIA, the Metropolitan Tree Improvement Alliance. Journal of Arboriculture, 4 (3): 62-66.

²Gerhold, H.D., D.F. Karnosky and H.M. Heybroek. 1983. Urban Tree Cultivar Exchange Program of the Netherlands and the United States. Journal of Arboriculture, 9 (12): 309-316.

Insect & Disease - formed 1976

Mission: improving the protection of high-value urban forest vegetation from destructive biotic elements in the urban environment.

Although much was known about the effects of insects and diseases on forest trees, little of this information could be directly applied to urban forests. There was, and still is, a need to evaluate the interactive effects of urbanization and the dynamics of insect and disease populations. The trust of the Insect & Disease Working Group was seen as enhancement of the various "yield" aspects of urban forests through development of sound biological understanding of how to insure maximum productivity from urban tree populations. They acknowledged that the benefits of urban forestry cannot be achieved without first reducing the destructive effects of various insects and diseases. As such, they categorized their research areas as follows:¹

- assessment of the present urban tree resource is essential to determine priorities.
- biological understanding of specific insect and disease agents is the basis for control recommendations.
- basic understanding of systems will provide a base of information for stable management of urban tree populations.
- the urban forest manager has little to guide him in decision-making except his own experience and advice from other arborists.

A study showing great potential for Dutch elm disease control programs was led by Gerald Lanier of SUNY CESF. Poisoned trap trees baited with pheromones effectively eliminated more than four-fifths of an hatching elm bark beetle population before they reached the adult stage.² Another research team compared red oak and sugar maple injuries caused by chemical injections, and found that injections in the trunk and in the hills of large root flares were the least damaging.³

Down in SUNJ Cook College, Ronald Myers examined the susceptibility of several pine species to pinewood nematode, which has caused serious problems for urban forest managers in some northeastern states.⁴

¹Manion, P. 1979. **Insect and Disease Problems of the Urban Environment: Problem Analysis**; final report. 5pp. (unpublished)

²O'Callaghan, D.P., E.M. Gallagher and G.N. Lanier. 1979. **Field Evaluation of Pheromone- Baited Trap Trees to Control Elm Bark bBeetles**. *Journal of the New York Entomological Society*, 86 (4): 312.

³Wisniewski, S.G. and R.O. Blanchard. 1982. **Effect of Injection Site on Injury Sustained From Chemical Injections in Oak and Maple**. *Phytopathology*, 72 (2): 267. (abstract)

⁴Myers, R.F. 1982. **Susceptibility of Pines to Pinewood Nematode in New Jersey**. In: J.E. Applebey and R.B. Malek (eds.), *Proc. National Pine Wilt Disease Workshop*, University of Illinois: 38-46.

Planning and Management - formed 1973, reformed 1977 (formerly known as Land Use Policy)

Mission: improvement of 1) the management of urban forest ecological systems, and 2) decision making and planning models involving social, economic, biological, and ecological analyses of urban forest resources.

Changing land use patterns have had a variety of impacts on forest land. In response to this, the Planning and Management Working Group developed a most comprehensive Problem Analysis looking at how the quality of urban life can be improved through the rational planning and management of urban vegetation.¹ Three broad areas within this overall goal were recognized:

- background data and supporting information;
- public policy decision making and the development of planning and land use guidance systems, and;
- implementation and evaluation techniques.

Researchers at Princeton University showed that state and local government ordinances are quite ineffective in preserving urban forests and open spaces. There are few that detail the human, ecological, and physical constraints on removal of urban forest vegetation, and even those that do are rarely evaluated, and seldom enforced.² According to a study by Teuvo Airola of Rutgers University, local planners and decision makers also overlook residual open spaces (ROS) despite their potential as recreation resources.³

On a more positive note, Peter Pizor and George Nieswand, also from Rutgers University, reviewed one innovation in land use planning known as transfer of development rights (TDR) that has proved more successful.⁴ Their work, and particularly that of Pizor, has recently drawn renewed interest from planners in northeastern New Jersey where urban spill-over from New York City is causing serious land-use problems.

¹Lewis, A.R. 1978. Problem Analysis: Urban Forestry Planning and Management Working Group. 23pp. (unpublished)

²Gutman, R. and J. Landry. 1977. An Analysis of Tree Ordinances: The Example of New Jersey. Journal of Arboriculture, 3 (10): 191-197.

³Airola, T.M. and D. Wilson. 1982. Recreational Benefits of Residual Open Space: A Case Study of Four Communities in Northeastern New Jersey. Environmental Management, 6 (6): 471-484.

⁴Pizor, P.J., G.H. Nieswand and J.A. Swanson. 1979. A Transfer of Development Rights Sampler: A Collection of TDR Ordinance From Municipalities in Eight States. New Jersey Agr. Exp. Sta. Bull. 612. New Brunswick, NJ; Pizor, P.J. and B.B. Chavooshian. 1982. Non-Metropolitan Transfer of Development Rights Programs: Program Experience in the Middle Atlantic States. In: F. Schnidman (ed.), Transfer of Development Rights. Heath, Lexington, KY.

Social and Behavioral Issues - formed 1975 (formerly known as Recreation and Landscape)

Mission: improving social well-being of urban people through improving recreation and aesthetics through urban forest management.

The Social and Behavioral Issues Working Group addressed significant questions about the use, perception, and meaning of urban forested lands. They felt it important that the Consortium recognize the needs of people, who, after all, are one half of the urban forestry equation. For example, the educational role of urban parks has grown in significance as urbanites find themselves increasingly remote from rural environments. The broad nature of their goals emphasized a number of disciplines within the working group, notably recreation, interpretation, visual quality, and economics. The group's primary responsibilities were:

- to formally define problem areas associated with the delivery of recreation and landscape services via urban forests.
- to formulate a program of research directed toward resolving the most critical problems.
- to enhance communication, coordination, and cooperation among interested university and Forest Service scientists in the northeast, such that greater attention would be directed to problems of urban forest recreation and landscape management.

Much of the working group's research would never have materialized had it not been for Consortium grants. They often lost out to projects in the pure sciences, whose results seemingly offered more direct benefits for an audience. Indeed, the Consortium was occasionally guilty of that very bias itself, as the working group pointed out in their Problem Analysis.¹

Their work had many indirect applications, often providing background material for city park management plans.² Julius Fabos from the University of Massachusetts received two grants for his work on the Metropolitan Landscape Planning Model (METLAND). This important planning tool predicted land and water resource-use changes caused by alternative development programs, thereby enabling decision makers to draw up a much more complete picture when considering proposals for urban development.³

Another University of Massachusetts team looked at the economic benefits of urban parks. Their work confirmed that urban parks frequently add to property values in surrounding neighborhoods but the group also cautioned that heavy park usage can actually reverse this pattern and cause a decrease in house prices instead.⁴ Related to this was a study by Brian Payne from the NEFES research unit in Amherst MA, who noted a significant increase in the value of properties endowed with individual or small clusters of trees.⁵

Jeff Hayward headed a third project from the University of Massachusetts investigating public awareness and perceptions of neighborhood parks. He found local residents frequently uninformed or mistaken about their local recreational facilities, and so designed a series of information brochures to remedy the problem.⁶

Perhaps no other study demonstrated the breadth of urban forestry applications as well as that undertaken by Roger Ulrich from the University of Delaware. His work on restorative influences in hospitals revealed that assignment to a room overlooking a natural setting resulted in significantly shorter postoperative stays than those patients recovering in rooms facing a brick wall. The results had important implications for hospital design.⁷

¹Twight, B. 1982. Research Needs for Environmental Problems Related to Recreation and Landscape Management in Densely Populated Areas; final report. 17pp. (unpublished)

²Hayward, D.G. and W.H. Weitzer. 1983. Understanding Urban Park Users: A Key to Effective Planning and Management. *Parks and Recreation Resources*, 2 (2): 24-27.

³Fabos, J.G. and K.H. Ferris. 1977. A Computerized Model for Integrating the Physical Environmental Factors into Metropolitan Landscape Planning. In: *Northeastern Forest Experiment Station, Proc. Conf. on Metropolitan Physical Environment*. USDA Forest Service Gen. Tech. Rep. NE-25. NE. For. Exp. Sta., Broomall, PA: 422-431.

⁴More, T.A., T.H. Stevens and P.G. Allen. 1982. The Economics of Urban Parks: A Benefit/Cost Analysis. *Parks and Recreation Journal*, 17 (8): 31-33.

⁵Payne, B.R. and S. Strom. 1975. The Contribution of Trees to the Appraised Value of Unimproved Residential Land. *Valuation*, 22 (2): 36-45.

⁶Hayward, D.G. and W.H. Weitzer. 1984. The Public's Image of Urban Parks: Past Amenity, Present Ambivalence, Uncertain Future. *Urban Ecology*, 8: 243-268. See also Hayward, D.G. 1981. When You Think of Forest Park....Info. Brochure. University of Massachusetts, Amherst, MA. 4pp.; 1981. When You Think of Green Hill Park....Info. Brochure. University of Massachusetts, Amherst, MA. 4pp.

⁷Ulrich, R.S. 1984. View Through a Window May Influence Recovery From Surgery. *Science*, 224 (4647): 420-421.

In its later years, audience involvement became very important to the Social and Behavioral Issues Working Group. They regularly invited practitioners to their meetings, like the City Commissioner for Parks and Recreation from Hartford, CT. This enabled the scientists to remain in touch with the needs of their audiences, who could in turn keep up with the latest activities of the working group. Another point emphasized was 'follow-up'. Once a project was completed, and the results disseminated, working group scientists would remain in contact with their audience until they were satisfied that the former were incorporating the research results in a proper and sensible manner. This could mean many more months of communication after a project was officially closed.

Soils - formed 1974

Mission: improving the understanding of soil structure, fertility, and other characteristics affecting urban forest management, including the role of soil in water retention and as a sink for pollutants.

Recognizing that urbanization has drastically disturbed millions of acres of soil, the Soils Working Group focused their efforts on the unique properties of urban soils. In particular, they investigated the effects of urbanization on soils, how to avoid or reduce those effects, and how to rehabilitate soils that were formerly rich and productive.

Scientists from the University of Massachusetts evaluated and classified urban soils on the basis of compaction, nutrient loss, and water loss, all of which influence the development of tree root systems.¹ Another team from Massachusetts showed that removal of forest basal areas, combined with a tendency for developers to cut trees on the basis of size alone, decreases the survival chances of small forests on urban housing developments.² On the other hand, tree stress caused by other factors such as soil nutrient deficiencies can be alleviated through application of composts like the one developed by George Estes at the University of New Hampshire from ground hardwood bark and sewage sludge.³

One of the most effective technology transfer projects ever undertaken by the Consortium was the 1982 workshop on urban soils developed by the Soils Working Group.⁴ This workshop proved to be so successful that during the next year, another seven were held around the country, enabling the scientists to reach over 500 practitioners in total.

¹Ruark, G.A., D.L. Mader and T.A. Tattar. 1982. The Influence of Soil Compaction and Aeration on the Root Growth and Vigour of Trees — a Literature Review. Part I. *Arboricultural Journal*, 6 (4): 251-265; 1983. The Influence of Soil Moisture and Temperature on the Root Growth and Vigour of Trees — a Literature Review. Part II. *Arboricultural Journal*, 7 (1): 39-51.

²Van der Grinten, M., B.F. Wilson and B.C. Fischer. 1977. Forest Structure, Composition, and Vigor in Housing Developments. *Journal of Forestry*, 75 (10): 653-655.

³Estes, G.O. and R.H. Harter. 1974. Preparation, Characterization, and Use of Park Sewage Compost; final report. 82pp. (unpublished)

⁴Craul, P.J. (ed.). 1982. *Urban Forest Soils: A Reference Workbook*. USDA Forest Service, SUNY College of Environmental Science and Forestry, Syracuse, NY, and USDI National Park Service. 185pp.

Water Quality - formed 1974

Mission: improving the management of forested municipal watersheds for urban water supply, recreation, and other uses.

The link between urbanization and watershed management is broad and multi-dimensional. Urban development typically changes the natural topography, reduces vegetative cover, and increases the area covered by buildings and pavement. These changes cause decreased infiltration of water into the soil, and increased surface run-off, erosion, sediment pollution, and flooding. Limiting this damage is best achieved through preventive rather than corrective management, which in turn requires relevant and accurate information.¹

The mandate of the Water Quality Working Group reflected this, describing its field of study as:

- the impact of land-use changes, especially at the urban frontier, on water quality and quantity.

While based at the NEFES research unit in Pennington, NJ, Edward Corbett directed studies examining how the quantity and quality of water supplies can be increased by managed cuttings on key watersheds to reduce transpiration, or by planting selected species that transpire at a low rate.² Water quality and quantity as affected by resource management was also the focus of a 1979 workshop organized by James Lynch at Pennsylvania State University.

Other scientists at Pennsylvania State University concentrated on in-depth analyses of land application of treated municipal wastewater and sludge. Enactment of the 1972 Federal Water Pollution Control Act Amendments quickly revealed that though much information was already available on such applications, little was known about their effects. Responding to this paucity, William Sopper showed that forests can purify effluent from treated municipal wastewater, with the additional benefit of increasing tree growth.³ Sopper also demonstrated that urban sludges can be used in an environmentally safe manner to revegetate mined land.⁴

The Water Quality Working Group used three of the more than twenty grants awarded to its proposals to fund symposia that gave rise to important handbooks on watershed management, and wastewater and sludge applications.⁵ These and many of the working group's research projects were later used as reference materials for the Environmental Protection Agency's 1981 Process Design Manual for Land Treatment of Wastewater.⁶ Several grants also funded the research efforts of seven graduate students.

¹Sopper, W.E., J.A. Lynch and E.S. Corbett (eds.). 1976. *A Problem Analysis for Environmental Forestry Research: Water Resources at the Forest-Urban Interface*. NE. For. Exp. Sta. Gen. Tech. Rep. PA-2. USDA Forest Service, Broomall, PA. 47pp.

²Corbett, E.S., J.A. Lynch and W.E. Sopper. 1975. *Forest Management Practices As Related to Nutrient Leaching and Water Quality*. In: Proc. Conf. on Non-Point Sources of Water Pollution. Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University: 157-173.

³Sopper, W.E. 1975. *Use of the Soil-Vegetation Biosystem for Wastewater Recycling*. In: R.L. Sanks and T. Asana (eds.), *Land Treatment and Disposal of Municipal and Industrial Wastewater*. Ann Arbor Science Publishers, Ann Arbor, MI: 17-43.

⁴Kerr, S.N. and W.E. Sopper. 1981. *Utilization of Municipal Sludge for Woody Biomass Production on Mined Land*. In: Proc. Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation. University of Kentucky, Lexington, KY: 313-317.

⁵Sopper, W.E. and L.T. Kardos (eds.). 1973. *Proc. Symp. on Recycling Treated Municipal Wastewater and Sludge through Forest and Cropland*. Pennsylvania State University Press, University Park, PA. 479pp.; Northeastern Forest Experiment Station. 1975. *Proc. Symp. on Municipal Watershed Management*. USDA Forest Service Gen. Tech. Rep. NE-13. NE. For. Exp. Sta., Broomall, PA. 196pp.; Sopper, W.E. and S.N. Kerr (eds.). 1978. *Proc. Symp. on Utilization of Municipal Sewage Effluent and Sludge on Forest and Disturbed Land*. Pennsylvania State University Press, University Park, PA. 560pp.

⁶EPA. 1981. *Process Design Manual for Land Treatment of Wastewater*. EPA Publ. 625/1-81-013. EPA, Cincinnati, OH. The Environmental Protection Agency decided that the preferred treatment of wastewater was application through the living filter of the ground.

Wildlife - formed 1975

Mission: improving wildlife habitat for spectator enjoyment, with emphasis on non-game species.

Urbanization can significantly affect wildlife. Development invariably means fewer undisturbed woodlots and decreased vegetative diversity, as well as increased noise and air pollution. The problems are heightened by a frequent lack of citizenry awareness regarding their own potential to impact wildlife populations, and fear of some animal species and/or disease transmission.

The Urban Wildlife Working Group acknowledged some of these factors in their Problem Analysis,¹ which was based in part upon presentations given at a 1973 urban wildlife symposium.²

- Human preferences and attitudes toward urban wildlife.
- Habitat requirements and ecology of desired wildlife species.
- Methods for increasing desirable human-wildlife interactions in urban environments.

Like their counterparts in the Social and Behavioral Issues Working Group, urban wildlife scientists found that research funds were difficult to come by in their particular field. Hence the thirteen grants awarded to the Wildlife Working Group by the Consortium were invaluable. Most supported studies of avian distribution patterns and diversity in urban areas. In a study of oak forest patches in New Jersey, for example, Richard Forman at Rutgers University found that a single large woodlot contained more bird species than the same area subdivided into smaller woodlots, leading him to suggest that protecting large forests should be a primary priority of land use planners interested in preserving local avian diversity.³ This grant was also one of several that supported a total of eleven advanced degree research projects in urban wildlife.⁴

Several cooperative projects were undertaken in conjunction with Richard DeGraaf from the NEFES research unit in Amherst, MA. A five-year study in the town revealed that woody vegetation alone accounted for 50% of all the variation in breeding bird species numbers.⁵ The results of another study there looking specifically at suburban vegetation types suggested that native forest is far more attractive to insectivorous bird species than planted habitats.⁶

DeGraaf was also more successful than most Consortium scientists in reaching a larger and more general audience. Between 1973-79, in addition to publishing in the usual research journals, he authored or co-authored four popular articles as well as one book that are all still of great interest to the (sub)urban homeowner.⁷ Though his success can in part be attributed to the high "marketability" of wildlife, as compared with certain other facets of urban forestry research, it should in no way lessen the fact that DeGraaf consistently and successfully wrote papers and articles for the lay public.

¹George, J.L. 1982. *Urban Wildlife: A Problem Analysis for Environmental Forestry Research*. Agricultural Experiment Station, Pennsylvania State University, University Park, PA. 22pp.

²Noyes, J.H. and D.R. Progulski (eds.). 1974. *Proc. Symp. on Wildlife in an Urbanizing Environment*. University of Massachusetts Coop. Extension Serv., Monograph Series No. 28. Amherst, MA. 182pp.

³Forman, R.T., A.E. Galli and C.F. Leck. 1976. Forest Size and Avian Diversity in New Jersey Woodlots, With Some Land-Use Implications. *Oecologia* 26 (1): 1-8.

⁴Rudis, V.A. 1975. *Urbanization as a Multiple Stress Affecting Forest Soil Arthropod Communities*. M.S. Thesis. Rutgers University, New Brunswick, NJ. 101pp.; Paulick, R.K. 1976. *The Determination of Habitat Components Utilized by Avian Species in a Planned Suburban Community*. M.S. Thesis. Pennsylvania State University, University Park, PA. 118pp.

⁵Goldstein, E.L., M. Gross and R.M. DeGraaf. 1986. Breeding Birds and Vegetation: A Quantitative Assessment. *Urban Ecology*, 9 (3/4): 377-385.

⁶DeGraaf, R.M. and J.M. Wentworth. 1986. Avian Guild Structure and Habitat Associations in Suburban Bird Communities. *Urban Ecology*, 9 (3/4): 399-412.

⁷Thomas, J.W., R.O. Brush and R.M. DeGraaf. 1973. Invite Wildlife to Your Backyard. *National Wildlife*, 11 (3): 5-16; DeGraaf, R.M. and J.W. Thomas. 1974. Toward Nongame Management. *Massachusetts Wildlife*, 25: 14-15; DeGraaf, R.M. and J.W. Thomas. 1974. A Banquet for the Birds. *Natural History*, 83: 40-45; Thomas, J.W. and R.M. DeGraaf. 1974. Raccoons on the Roof. In: *Gardening With Wildlife*. National Wildlife Federation, Washington DC: 153-168; DeGraaf, R.M. and G.M. Witman. 1979. *Trees, Shrubs and Vines for Attracting Birds — A Manual for the Northeast*. University of Massachusetts Press, Amherst, MA. 194pp.

CONSORTIUM GRANTS

The true value of a Consortium grant greatly exceeded its actual dollar amount. A proposal requesting \$20,000, for example, never included the financial worth of any collaborative work undertaken by a NEFES research unit in its overall cost outline because the Station paid employee salaries directly from its own operating budget, rather than through the Consortium. Similarly with university scientists, whose time was normally paid for by the university.¹ Hence a \$20,000 grant might in reality be worth double that amount.

The value of a grant was increased yet further by the Consortium allowing the universities to claim as indirect costs a maximum of only 25% of total costs. This was unusually low compared to other funding operations, causing one or two institutions to occasionally question the policy. But the Executive Committee never changed it. They saw the Consortium as a catalyst, as a provider of seed money, and preferred to see grants spent directly on research activities rather than on administration. As a result, they refused to review or pass on to the NEFES any proposal that exceeded the 25% limit.

Another factor in this preference for a 25% ceiling was the relatively low sums of money granted to the Consortium. Excluding administrative costs, the average grant was \$15,051. If the universities had taken up to 60% of this total for indirect costs, as was then the norm, there would have been little left for research. But because they were willing to accept a substantial share of the indirect costs, the Consortium was able to accomplish a much larger research program than could normally be expected with such limited funds.

Graduate students also helped to stretch grants. The Executive Committee expressed a strong preference for proposals offering graduate financial support, for this not only attracted more young people to urban forestry, it also spread research responsibilities among a wider population, and brought in new ideas. The most obvious benefit was the low cost of employing graduate students. Far more research could be undertaken for the same amount of money, even though the quality of student work often bore comparison with faculty efforts. Institutions also favored this approach, since it allowed them to recruit better students. Indeed, it is debatable whether some institutions would have remained in the Consortium had they not been allowed to include graduate financial support. Federal law, however, prohibited the NEFES from paying tuition on grants or cooperative agreements. This meant that the Station could only accept proposals that contributed toward student research activities but not toward tuition costs. Nonetheless, Consortium grants still funded research for a total of thirty-six M.S. theses and ten Ph.D. dissertations.

Much of the graduate research was conducted by students at SUNY CESF or Pennsylvania State University. This reflected the early dominance of the two institutions within the Consortium. Indeed, the pair won over 59% (\$1,069,504) of the total funds awarded by the NEFES between 1971-79. The primary factor behind this success was simply size — the number of faculty conducting environment-related research at these two schools far outnumbered those at the other member universities. But as the Consortium moved into the Eighties, membership increased and so did the overall number and quality of proposals. The added competition showed itself in the distribution of grants during the period 1980-84, when faculty at SUNY CESF and Pennsylvania State University saw their share of Consortium funds drop to 41% (\$427,070).

Distribution of grants by working group occasionally showed similar changes. The Water Quality and Amenities Working Groups, for example, encountered a more moderate success rate after a early period of dominance. The fact that scientists in the two working groups were predominantly from SUNY CESF and Pennsylvania State University suggests that the trend was not coincidental. The Planning and Management Group, on the other hand, more than doubled its percentage of successful proposals after 1979. But for the most part, working groups managed to maintain their funding levels at consistent rates, and showed little variation. Overall, Amenities won the most grants, followed by Genetics, Planning and Management, Social and Behavioral Issues, Air Quality, and Water Quality. This distribution was partly the product of expertise in some fields of study, and ignorance in others, particularly during the early years, but the crucial factor was leadership, or in some cases, lack thereof (see THE WORKING GROUPS).

Irrespective of subject matter, not all Consortium projects developed new lines of research. Some simply led to a dead end. But that in itself was valuable, for it turned scientific interest toward other directions, and did so without the expenditure of huge sums of money. For the most part, though, Consortium grants provided seed money for projects that, once moving, showed sufficient promise for other sources to accept responsibility for future funding. The result was a rippling effect whereby small but strategic federal investments totalling almost three million dollars contributed to research beneficial to millions of people living in the urban and suburban areas of the northeast.

¹The only problem with this was that the Consortium may have lost some valuable personnel through failing to cover summer salaries of faculty members who were on a nine-month appointment.

Fiscal year	Research studies, problem analyses, symposia, and technology transfer		Administration, travel, and planning		Total	
	No.	Amount (\$)	No.	Amount (\$)	No.	Amount (\$)
1971	6	77,098.50			6	77,098.50
1972	7	174,915			7	174,915
1973	12	170,530	1	12,000	13	182,530
1974	20	176,193			20	176,193
1975	22	271,847	1	12,000	23	283,847
1976	17	200,800	1	10,000	18	210,800
1977	17	169,022			17	169,022
1978	16	247,392	2	35,500@	18	282,892
1979	16	269,853			16	269,853
1980	14	250,553	1	23,095*	15	273,648
1981	10	243,296	2	30,649*	12	273,945
1982	7	164,768	1	10,000	8	174,768
1983	9	159,344	2	28,457*	11	187,801
1984	6	118,540	1	18,000*	7	136,540
TOTALS	179	\$2,694,151.50	12	\$179,701	191	\$2,873,852.50

@ Total includes \$16,000 for the First National Urban forestry Conference and \$19,500 for the Intergovernmental Personnel Act (IPA) agreement for Lee Herrington during his term as Executive Secretary.

* Totals include Intergovernmental Personnel Act (IPA) agreements for Lee Herrington and David Karnosky during their respective terms as Executive Secretaries.

FIGURE THREE: Consortium grants 1971-84

University	Year joined Consortium	Number of grants	Total funding (\$)
Connecticut	1971	7	120,161
Cornell	1971	10	200,515
Delaware	1980	1	9,809
New Hampshire	1971	8	129,670
Massachusetts	1971	22	309,185
State University of New York, Syracuse	1971	47	693,902
Ohio State	1980	2	42,137
Pennsylvania State	1971	55	802,672
Princeton	1971	6	93,150
Rutgers	1971	16	255,540
Vermont	1980	1	15,090
Yale	1971	7	65,983.50
Other		9	136,038
		<u>191</u>	<u>\$2,873,852.50</u>

FIGURE FOUR: Consortium Grants to Universities, 1971-84

Working Group	First Year Funded	Number of grants	Total funding (\$)
Air Quality	1973	20	291,112
Amenities	1973	30	459,194
Genetics	1973	25	374,127
Insects & Disease	1977	8	148,855
Planning & Management	1973	23	359,177.50
Social and Behavioral Issues	1975	20	248,689
Soils	1974	16	269,119
Water Quality	1974	18	290,606
Wildlife	1975	14	215,922
Independent		2	15,650
Technology Transfer		3	21,700
Administration		12	179,701
Total		191	\$2,873,852.50

Note: Grants awarded before the creation of working groups have been categorized according to the area of study

FIGURE FIVE: Consortium Grants to Working Groups, 1971-84

THE PROPOSAL REVIEW PROCESS

Screening proposals can cause nightmares for research program administrators. It requires good organizational skills, more than a working knowledge of the intended area of study, and above all else, objectivity. Nothing destroys confidence in a granting institution more than accusations of an "old boy" network or other forms of bias.

This was especially relevant to the Consortium, for the majority of scientists who submitted proposals were familiar to, and often friendly with, the reviewers. For the most part, the Consortium managed to avoid any such controversy by reviewing proposals on merit and regularly evaluating the review process for any weaknesses. There were only occasional instances of scientists questioning decisions, though there was certainly never a lack of lively discussion at the meetings.

Evolution of the review process mirrored the growth of the Consortium. It was simple to begin with, incorporating neither outside reviewers nor any rankings based on politics. The sole screening agency was the Executive Committee. But as institutional cooperation improved and familiarity with the Consortium spread throughout the northeast, so did the number and quality of proposals. Executive Committee members found that proposals involving several disciplines were usually more thorough, better written, and provided more research production per dollar invested. For a research program, this was most desirable. However, the numbers were also overwhelming. The Executive Committee found themselves devoting more and more time to reviewing more proposals competing for a limited number of grants. To share the load, they brought the working group chairpersons into the process. But the volume of proposals continued to expand, and so they developed a network of independent reviewers and a more comprehensive method of appraisal. The creation of an Executive Secretary provided further stability and consistency, and by 1980, the Consortium was operating a standardized system of peer review.

The process began with principal investigators submitting preliminary proposal abstracts to the chairpersons of the appropriate working group. The chairpersons then came together as a group in a meeting with the Executive Secretary, where they reviewed the proposals to identify those that pertained to the missions of more than one working group. No chairperson was allowed to review proposals from their own working group. Based on their findings, the chairpersons might suggest that proposals submitted through one working group be simply reviewed by other working groups for informational purposes, while there were other instances of proposals requiring submission through a different working group entirely. While together, the chairpersons and Executive Secretary also discussed the broader relationship between the proposed studies and working group, Consortium, and urban forestry needs. Finally, if the preliminary abstracts were deemed suitable for submission to the Consortium, the chairpersons would encourage principal investigators to submit final abstracts.

Abstracts not only precipitated the early stages of the review process, they also enabled the Executive Secretary to estimate how many reviewers, by discipline or speciality, would be required. This allowed the officer to forewarn all reviewers of when to expect the proposals, and when to return them. If deadlines could not be met, there was still time to secure another reviewer.

Meanwhile, the working group chairpersons put together packages that contained proposals from members of their own working group only (see APPENDIX FOUR). The Executive Secretary sent these on to the reviewers. The latter then had one week to complete a technical review of each proposal, whereby the scientific merit of the proposal was evaluated (see APPENDIX FIVE). Four technical reviews were sought, two from peers active in the relevant discipline, and two from scientists with the breadth of background needed to review an entire working group package.¹ But by 1983, a shortage of qualified reviewers had reduced the number to two per proposal.² Only if more than ten points on a scale of fifty separated the two reviews was a third review invited.

Despite the large number of people involved, reviews were rarely returned late. Advance warning from the Executive Secretary enabled reviewers to plan their schedules, and the one-week limit persuaded them to look at proposals as soon as they arrived.

¹To begin with, reviewers did not have to be affiliated with either the Consortium or the Forest Service. But after 1980, one of the four had to be a Forest Service scientist.

²It is worth noting that in 1982, the Consortium had expanded its circle of reviewers to 68 scientists and practitioners around the country. The continued growth in the number of proposals submitted for consideration, however, meant that there were still not enough reviewers to screen each one adequately under the current system of four reviews per proposal. Including the reviewers, scientists, Executive Committee members, and Forest Service personnel, the Consortium could boast significant contributions from over two hundred individuals nationwide, quite impressive for an operation with an annual budget averaging less than \$210,000.

Only those proposals with good technical reviews made it to the second stage of the process, which was an administrative review by the Executive Committee. Officers ranked the final list according to such factors as:

- the technical score;
- where applicable, the proposers' performance on past grants, notably final reports submitted and publications;
- the number of active Consortium grants already awarded the proposer;
- the importance of the proposed work to Consortium goals and objectives;
- the performance and history of the WG;
- anything else the committee deemed important.

The Executive Secretary then submitted the ranked proposals to the NEFES Director for approval, and also negotiated any necessary changes with the principal investigators of accepted packages. If he felt strongly enough, the Station Director could veto a proposal but this right was exercised only once in fourteen years.¹

Finally, accepted proposal budgets were negotiated with appropriate university representatives by the NEFES's Budget and Fiscal Officer, and the grants awarded accordingly.

Typical schedule of grant proposals

June	- Call for proposals
September	- Deadline for preliminary abstracts
October	- Deadline for final abstracts
November	- Distribute proposals to reviewers
December	- Reviewers met together to compare ratings and arrive at a consensus, before attending a second meeting with the Executive Committee to decide whether to recommend/reject proposal for funding.
	- Executive Committee convened immediately afterward to rank proposals. All accepted proposals were ranked, even if the total of requested budgets exceeded the Consortium's annual allocation.
January	- recommendations sent to NEFES Station Director.
	- NEFES Budget and Fiscal Officer negotiates with appropriate university representatives
February	- announcement of awards.

¹This record again illustrates the NEFES' confidence in Consortium decisions. As stated earlier, they were determined to let the universities operate as independently as possible, and showed no inclination at all toward heavy-handedness.

TECHNOLOGY TRANSFER

The nine charter members stated that the purpose of the Consortium was, among other things, "to publish and otherwise disseminate the results of [their] research".¹ Though the term 'technology transfer' was not specifically mentioned until the revised charter of 1983,² this original statement certainly implied that the Consortium gave some priority to dissemination.

Until 1975, though, true technology transfer efforts were few and far between. This was hardly surprising since it can take as long as two or three years before scientists have accumulated sufficient research data to merit dissemination. Hence most of the Consortium's early technology transfer activities were geared toward technology accumulation — what did practitioners need from researchers? What was the current state-of-the-art in urban forestry? What was the future of urban forestry and its various components?

After four or five years of technology accumulation, the Consortium began to establish itself. A number of grants were already closed or near to completion, and the first Problem Analyses had been finished. The growing volume of information brought with it a rise in the number of publications, symposia, and workshops, causing technology transfer to become a significant component of the Consortium program. Any lingering doubts about its importance were removed after Lee Herrington travelled to Washington DC in 1975 to investigate potential funding agencies. Though the trip failed to produce any definite offers of financial support, all four agencies approached by Herrington emphasized their concern for technology transfer.

Refereed scientific and technical journals proved to be the most popular choice of most scientists. Indeed, the Consortium relied heavily on its publication record for survival, and since 1971, over 130 reports have been published in such noted publications as Science, Journal of Forestry, Journal of Arboriculture, Journal of the Acoustical Society of America, Environmental Management, Phytopathology, and Urban Ecology. But some scientists were keen to reach a larger audience. In particular, they wanted to fulfil the Consortium's stated intent to improve "urban man's understanding of his interrelationships with, and determining his needs for, urban forest environments".³ This seemed to suggest to them a much larger and more general audience than just practitioners.

Rowan Rowntree, a NEFES scientist based at the Syracuse research unit, was one who subscribed to this view. He suggested that "ways must be pursued to make the information available to the lay person. There is also a middle ground: the technical article in a journal read by non-scientists".⁴ But despite generating a mass of information of interest to "the lay person", the Consortium rarely pursued that larger audience. This despite the fact that those who did found great success, notably Richard DeGraaf with his National Wildlife piece on ways to attract wildlife to an urban backyard,⁵ Brian Payne with his study of the contribution of trees to property values in Natural History,⁶ and David DeWalle with an extension circular on home energy conservation.⁷

It was a very unfortunate oversight, for the best place to start conservation education is at home, in the backyard, and in the workplace. The backyard especially is for many people their only chance to observe natural systems in operation. Bearing this in mind, Consortium researchers should have been encouraged to vary their usual route of professional journals with some mass audience outlets, like periodicals specializing in gardening, home improvement, ornithology, wildlife, and recreation. Production costs would have been minimal or zero, for the popular magazines normally pay for articles (journals often charge). More significantly, such periodicals would have promoted the Consortium across a larger audience. This might in turn have attracted attention from the big corporations, who are always interested in good publicity, and thus perhaps more willing to sponsor research and/or technology transfer. Of course, as all university scientists know, popular periodicals normally merit zero credit in the tenure process but for those involved with the Consortium, the financial and technology transfer benefits would certainly have been worth considering. As John Bethea of the Florida Division of Forestry once said, "we can't take all the people in the city to the forest, so let's take the forest to the city".

¹Charter of the Consortium for Environmental Forestry Studies. 1971. Article II. See APPENDIX ONE.

²Charter of the Consortium for Environmental Forestry Studies. 1983. Article II. See APPENDIX TWO.

³Charter of the Consortium for Environmental Forestry Studies. 1971. Article II, 11. See APPENDIX ONE.

⁴Rowntree to Karnosky, June 1982. Consortium Files.

⁵Thomas, J.W., R.O. Brush and R.M. DeGraaf. 1973. Invite Wildlife to Your Backyard. National Wildlife Magazine, 11 (3): 5-16.

⁶Payne, B.R. 1973. The Twenty-nine Tree Home Improvement Plan. Natural History, 82 (9): 74-75.

⁷DeWalle, D.R. and E.P. Farrand. 1978. Windbreaks and Shade Trees — Their Use in Home Energy Conservation. Pennsylvania State University Agr. Ext. Ser., Special Circular 245. University Park, PA. 8pp.

Articles in popular magazines are not the only way technology transfer can recover some or all of the initial outlay of monies. Advance orders enabled the Consortium to cover publishing costs for the proceedings of its 1972 symposium on "Recycling Treated Municipal Wastewater and Sludge through Forest and Cropland",¹ while the 1982 reference handbook on urban soils edited by Phillip Craul sold sufficient numbers to finance second and third editions.² Both examples support the argument that technology transfer can support itself if given a little time, effort, and imagination.

Symposia dealing with specific urban forestry issues were seen as another means of disseminating research results. This gave rise to a number of gatherings involving the Consortium (see APPENDIX EIGHT). Its most notable success came with the National Urban Forestry Conference in 1978, the first attempt to bring together under one roof the wide array of professionals working in urban forestry.³ Lee Herrington performed much of the groundwork for this four-day event while serving the Consortium under his Intergovernmental Personnel Act (IPA). The conference demonstrated the long-term worth of Consortium seed money probably better than any other single technology transfer activity undertaken by the universities, for follow-up events were held in 1982 and 1986, and another one is planned for 1989.⁴ They have all helped tremendously in uniting urban foresters.

Symposia and workshops can also bring in supplementary financing. The Water Quality Working Group, probably the most successful of any working group in tapping outside funding sources, obtained supplementary sponsorship for all three of their symposia. Some of this success can be attributed to the 1972 Federal Water Pollution Control Act Amendments, which brought a lot of money into water pollution research. But the working group's energetic efforts to search out potential sources undoubtedly contributed to their record. Individuals in the Amenities, Genetics, Soils, and Wildlife Working Groups also had limited success in this regard with symposia of their own.

Financial concerns at the start of the Eighties meant that technology transfer took on more and more significance as a means of raising additional sponsorship for the Consortium. In response, the Executive Committee funded a Technology Transfer Committee in 1980. Its mandate was to review the potential applications of the Consortium's production of scientific and technical information, as well as identify the most pressing needs of practitioners. The TT committee would then use those findings to develop an overall technology transfer program.

It was a move long overdue. The Consortium's technology transfer activities, although seemingly impressive at first glance, were in many instances an afterthought. Research by the working groups had often been conducted according to the needs of urban forestry as perceived by the scientists, rather than based on the assessed needs of practitioners. The Problem Analyses and gradual inclusion of outside reviewers in the proposal review process had helped to redress the balance somewhat but there was still a way to go. Indeed, the very nature of applied research programs such as that undertaken by the Consortium demands that technology transfer should be incorporated right from the very start. Though the Consortium had failed to do this in any formal manner, the Technology Transfer Committee was an attempt to rectify the mistake.

Unfortunately, it was slow to get off the ground, and added little to Consortium technology transfer activities. The committee's only significant contributions came with the Urban Forester's Notebook and a folder/poster display. Developed in early 1982, the latter combined photos and brief summaries of the working groups to highlight ongoing research, and had its first showing at the Consortium's annual meeting later that year. It then appeared at several other gatherings like the International Society of Arboriculture's annual meeting in Louisville, KY; Society of American Foresters annual meeting in Cincinnati, OH; Second National Urban Forestry Conference, also in Cincinnati; and the Urban Forest Interface Symposium in Seattle, WA.

The Technology Transfer Committee was not the Consortium's only attempt to develop a formal process for disseminating research results. In September 1980, the working group chairpersons recommended that the Consortium's annual meeting become a three-day technology transfer event. After Day One, when the annual meeting was normally held, invited practitioners would attend a series of technology transfer activities on

¹Sopper, W.E. and L.T. Kardos (eds.). 1973. *Proc. Symp. on Recycling Treated Municipal Wastewater and Sludge through Forest and Cropland*. Pennsylvania State University Press, University Park, PA. 479pp.

²Craul, P.J. (ed.). 1982. *Urban Forest Soils: A Reference Workbook*. USDA Forest Service, SUNY College of Environmental Science and Forestry, Syracuse, NY, and USDI National Park Service. 185pp.

³Hopkins, G. (ed.). 1980. *Proc. First National Conf. on Urban Forestry*. Washington, D.C. USDA Forest Service and SUNY College of Environmental Science and Forestry, Syracuse, NY. ESF publ. 80-003. 2 vol. 874pp.

⁴American Forestry Association. 1982. *Proc. Second National Conf. on Urban Forestry*. Cincinnati, OH. Am. For. Assoc., Washington DC; American Forestry Association. 1986. *Proc. Third National Conf. on Urban Forestry*. Orlando, FL. Am. For. Assoc., Washington DC. The Fourth Urban Forestry National Conference will be held in St. Louis, MI, on October 15-19 1989, with the American Forestry Association again playing a leadership role.

the second day, leaving Day Three for the working group meetings. The technology transfer day would be made up of invited papers and a poster session. A mechanism for feedback from those attending would be built into the structure of the meeting, and a proceedings published as well. But the universities indicated a strong preference that the money needed to fund this event be allocated instead toward additional research grants, and so just like the Technology Transfer Committee, the idea never realized its potential. By the time the Consortium was receptive to such an idea, it was too late.

THE CONSORTIUM FOR ENVIRONMENTAL FORESTRY STUDIES: A CONCLUSION

As the United States moved toward the Seventies, urban forestry constituted an assorted array of researchers and practitioners dotted around the country, struggling for funds in a field recognized by few. But a few persevered, succeeded in establishing the Pinchot Institute, and then went on to bring together under one umbrella a sizeable band of top researchers all working toward a common cause.

In their early foundation work, Consortium scientists were able to define the urban forest as a flexible concept encompassing a number of distinct sub-systems: streetside, residential, park, commercial, industrial, and vacant lands, all located within megalopolis. They also found it to be a unifying concept that included public and private, individual specimens and entire forests, and street trees and park trees. They then went on to contribute information in almost all aspects of urban forestry science, planning, and management. Indeed, a number of the working groups, notably Air Quality, Amenities, Genetics, and Water Quality, set the pace in their respective disciplines for over a decade, with much of their work, though undertaken in the northeast, having applications in urban forest management elsewhere in the country, and abroad.¹

Urban forestry also created jobs. By identifying and promoting the benefits of vegetation management, the Consortium prompted a number of local and regional governments to hire urban and community foresters, arborists, and other related professionals. Milwaukee's Bureau of Forestry currently employs over three hundred people during its peak planting/care season, while the city of Kansas has seven full-time urban foresters of its own. Events have turned full circle as this new generation of foresters implement planning and management policies that draw heavily on information generated by the Consortium. Furthermore, several of them used graduate projects funded by the Consortium to develop their knowledge and expertise in urban forestry.

Achievements such as these were in no small way due to the NEFES. The universities and NEFES were equal partners, despite the latter holding the purse strings. The Station willingly let Consortium members run their own show, and their trust was rewarded with a highly effective method of generating extra-mural research, most of which would never have been undertaken had it not been for their grants. Indeed, Consortium grants provided a mechanism through which the NEFES moved beyond normal disciplinary boundaries and into new fields of study.

Conversely, universities frequently expressed gratitude toward the NEFES, who continued to fund Consortium operations long after their congressional appropriations began to decline significantly. NEFES staff seemed determined to finish what they had started some fourteen years earlier, and so the Consortium was one of their last extra-mural programs to be cut.

Interaction was a big part of the Consortium experience. Although there have always been opportunities for scientists at any institution to communicate and collaborate on research, the initiative is rarely taken unless there is a specific goal to provide direction. The creation of the Consortium soon changed that, at least in urban forestry. It probably sparked more interaction between the universities and NEFES than any other research program operated by the Station, and certainly brought the two sides closer together. Contact occurred at all levels, from the NEFES Director attending Consortium annual meetings down to Station scientists collaborating with university researchers on a specific project. Both sides were left with a better understanding of each other's goals, activities, and methodology. There was even better rapport among the universities, not always the best of friends when it comes to competing for research funds.

The Consortium also broadened perspectives. Researchers in any field can become very single-minded in their work and fail to see the larger picture. The inter-disciplinary nature of urban forestry demanded that such isolation be minimized wherever possible, and the universities worked hard to achieve that through regular meetings at both the working group and consortium level. Though the problem was far from resolved, there are a number of former Consortium scientists from separate disciplines who continue to correspond with each other today.

But if the NEFES and the universities were jointly responsible for the success of the Consortium, they were also partly to blame for its demise. Consortium leaders, busy with their own university responsibilities, were unable to generate a general consensus of support for any recommendations regarding external funding, and

¹Members of the Genetics Working Group were not the only ones to develop international ties. Water Quality Working Group researchers, for example, received advisory requests from Russia, Poland, Iran, Peru, Australia, and Europe, to name a few. Closer to home, a number of Consortium scientists gave presentations based on their work at conferences in the southern and western states. Herrington, L.P. 1977. The Role of Urban Forests in Reducing Urban Energy Consumption; invited paper. In: Proc. Nat. Conven. of Soc. Amer. For.: 60-66; DeWalle, D.R. 1978. Microclimate Modification Using Urban Forests for Residential Energy Conservation in Space Heating and Cooling. In: Proc. Symp. on Forest Meteorology, Ottawa, Canada.

consequently failed to act until much too late. Even when they did eventually make a move, they were not aggressive enough in their search. Equally at fault was the Station, who appeared quite willing to provide financial support for the Consortium year after year despite acknowledging potential problems as early as 1976. It was not until the start of the Eighties that NEFES personnel made a concerted effort to alert the Executive Committee about supplementing their existing financial base, and it was another three years before the Consortium took those suggestions seriously.

Put simply, the Consortium fell victim to the old adage "if it ain't broke, don't fix it". Unfortunately, that adage is not only old, it is out of date. In the fast changing world of today, it has become "if it ain't broke, you just haven't looked hard enough".¹ Had they taken action earlier, the Executive Committee might have been able to take advantage of the growing interest shown by other universities in the northeast and elsewhere as the Consortium's reputation spread across the country. Instead, the rise in interest simply collided with declining financial support.

An injection of new blood might have helped the Consortium. Although it was attracting proposals from an increasingly large pool of scientists, the same researchers who had been with the Consortium from the start still held executive positions. In an organization as dynamic and diverse as the Consortium, new blood is not only desirable, it is necessary, as long as one avoids the inherent dangers of too high a turnover rate.

Of course, there is no guarantee that even if the universities had embarked earlier on an search for external funds, they would have been successful. A woeful reduction in research dollars over the past decade has caused severe declines in research operations around the country,² and the Consortium certainly felt the effects of that, first when the NEFES grants decreased and then the universities finally started looking elsewhere for support. But they clearly should have heeded the Station's warnings much earlier than they did in order to have enhanced their chances of survival.

Planning would also have rectified the Consortium's only other mistake, that of failing to realize the full potential of technology transfer. Despite some very successful early efforts by William Sopper and the Water Quality Working Group to attract outside sponsorship for symposia and/or publications, their lead was rarely followed. Most working groups were content to set aside part of their research grants for technology transfer programs, or write a separate proposal for a Consortium technology transfer grant. The enormous amount of public interest in urban and community forestry today suggests that the working groups were also remiss in restricting their choice of publication outlets to the usual range of technical journals (see CONTEMPORARY URBAN FORESTRY). This not unusual streak of conservatism in scientists is in sharp contrast to their often innovative and unconventional research techniques, as well as going against the Pinchot philosophy of "breaking new ground". One Consortium alumni explained this problem as "...a lack of willingness to step out of the comfortable publication arena and into the down and dirty of making their research results work for the public".

Hindsight, of course, is never there when needed, and so it is impossible to determine what would have happened had certain changes been implemented early enough. What can be determined, however, is that the Consortium achieved unparalleled success with its research and technology transfer programs in urban forestry. It provided a new component of forestry with a strong sense of identity and direction, established a permanent constituency of professional contacts and organizations, and generated a wealth of knowledge about how the urban forest can best meet the demands of urbanite populations in the northeast. The Consortium would have been the first to admit, though, that there is still an awful lot to do.

¹Peters, T. 1988. *Thriving on Chaos*. Alfred A. Knopf, New York: 3.

²Lanner, R.M. 1987. *Whither Forestry Research?* *Journal of Forestry*, 85 (3): 5.

CONTEMPORARY URBAN FORESTRY

Urban forestry continues to thrive today. Related programs are available at a number of schools and institutions, notably the University of Michigan, University of Wisconsin-Stevens Point, University of California, and SUNY CESF. METRIA is growing, with members in Canada and Holland as well as the United States, and regularly sponsors symposia and other meetings for the benefit of practitioners and scientists alike. Also flourishing is the joint United States-Holland project to promote the exchange of urban tree cultivars and related technical data between the two countries.¹

Representing all aspects of urban forestry is the American Forestry Association (AFA), which publishes a bimonthly newsletter for some 10,000 professionals and interested citizens.² Since 1981, the AFA has also sponsored the National Urban Forest Council, a network of 200 practitioners and community leaders. Much larger still is the Society of American Foresters (SAF), which has maintained an urban forestry unit since it first introduced a working group structure in 1972.

There have also been developments at the federal level. An urban forestry coordinator based in the State and Private Forestry offices of the Forest Service oversees their involvement in community projects. The Department of Agriculture recently added a Woody Landscape Plants Crop Advisory Committee to complement the more established and well-known crop advisory committees for corn, wheat, and others.

The most significant expansion, though, has occurred at the grass-roots level. Hundreds of communities around the country have activated volunteer tree planting and maintenance programs, like Trees Atlanta, Philadelphia Green, and the New York Street Tree Consortium.³ In Watertown, MN, about 60 volunteers got together with city crews and a local utility company to plant 520 trees along boulevards and in parks. Residents assumed responsibility for maintenance, and thanks to their efforts, an estimated 95% of the trees survived the first growing season.⁴

One of the most famous community campaigns is centered in Los Angeles, where Andy and Katie Lipkis formed TreePeople. With the help of hundreds of children, adults, and local companies, they successfully achieved their goal of planting one million trees before the 1984 Olympic Games, and made a significant and positive contribution toward reducing the city's air quality problems.⁵

But although urban forestry at the city and state level is strongly active, research direction at the national level has not been forthcoming. The AFA and SAF can only support limited research programs, while federal spending through the Forest Service has been restricted nationally to \$553,000 in the 1988 fiscal year, suggesting that priorities have changed since the days when the NEFES alone could allocate \$273,000 for Consortium projects. Furthermore, what little urban forestry research has been conducted recently has focused primarily on street trees, leaving trees in urban parks as a poor second.⁶

Nevertheless, urban forestry remains a billion dollar industry that will continue to expand as more and more people make their homes in the nation's urban centers. These urbanites want and need a more liveable environment. First, though, they need another coalescing agent to take the lead and break further new ground in urban forestry research in the United States.

¹Gerhold, H.D., D.F. Karnosky and H.M. Heybroek. 1983. Urban Tree Cultivar Exchange Program of the Netherlands and the United States. *Journal of Arboriculture*, 9 (12): 309-316.

²The National Urban Forest Forum, c/o The American Forestry Association, 1516 P Street, NW, Washington DC 20005.

³Dawe, N.A. 1988. Citizens with a Vision. *American Forests*, 94 (7&8): 26-28+.

⁴Mueller, D. 1988. All for Trees and Four for All. *The National Urban Forest Forum*, 8 (3): 1-2.

⁵TreePeople, P.O. Box 1984, Los Angeles, CA 90024.

⁶Loeb, R.E. 1987. The Tragedy of the Commons: An Update. *Journal of Forestry*, 84 (4): 29-33.

APPENDIX ONE: Charter of the Consortium for Environmental Forestry Studies¹

ARTICLE I. *Name and Location*

The name of this consortium shall be CONSORTIUM FOR ENVIRONMENTAL FORESTRY STUDIES. The principal office shall be at the Forest Service, U.S. Department of Agriculture, Northeastern Forest Experiment Station, Upper Broomall, Pennsylvania.

ARTICLE II. *Purpose*

This nonprofit Consortium is formed to initiate, support, and carry out programs of research and graduate education relating to the urban-forest interface in the Megalopolis of the northeastern United States; to establish, maintain, and operate such facilities as may be needed to carry out these missions; to publish and otherwise disseminate the results of research; and to carry out other activities as needed in furthering these endeavors.

Research will include, but is not limited to, the following general areas:

1. Improving decision making and planning models involving social, economic, biological, and ecological analysis of forest resources in areas of constantly increasing human pressures.
2. Increasing the amenities provided by forest resources.
3. Improving the management of forested municipal watersheds for urban water supplies, recreation, and other uses.
4. Genetic improvement of intensively used forest vegetation.
5. Site requirements for landscape tending.
6. Improving wildlife habitat for spectator enjoyment, with emphasis on nongame species.
7. Improving the social wellbeing of urban people through recreation and aesthetics in a forest environment.
8. Improving the management of urban-forest ecological systems.
9. Improving the protection of high-value forest vegetation from destructive actions of man and other agents.
10. Improving urban highways and intersections with forest vegetation.
11. Improving urban man's understanding of his interrelationships with, and determining his needs for, urban forest environments.
12. Improving social institutions and arrangements for using forest resources to improve the urban environment.

ARTICLE III. *Membership*

The Consortium for Environmental Forestry Studies shall be composed of the Northeastern Forest Experiment Station, Forest Service, U.S. Department of Agriculture, and selected and selected educational institutions within the eastern Megalopolis and the territory of the Northeastern Forest Experiment Station which have programs directly related to environmental forestry. The charter education institutions are: University of New Hampshire, Durham, New Hampshire; Massachusetts Agricultural Experiment Station, Amherst, Massachusetts; University of Connecticut, Storrs, Connecticut; Yale University, New Haven, Connecticut; State University College of Forestry, Syracuse, New York; The Cornell University Agricultural Experiment Station, Ithaca, New York; Princeton University, Princeton, New Jersey; Rutgers University, New Brunswick, New Jersey; and Pennsylvania State University, University Park, Pennsylvania. Additional education institutions may be invited to join the Consortium following procedures established in the bylaws.

No fee shall be required for institutional membership in the Consortium.

¹As of 1 February 1971.

An institutional member may resign at any time by giving 90 days notice to the Consortium. Forest Service membership shall continue as long as the companion Cooperative Agreement between the Forest Service and the Consortium remains in force.

ARTICLE IV. *Obligations of Member Institutions*

A. Northeastern Forest Experiment Station, Forest Service, U.S. Department of Agriculture, agrees to:

1. Provide funding as permitted by Congress and appropriate budget authorities for the purpose of undertaking research described in Article II within the framework of the Urban Forest Research Program. The Forest Service will, furthermore, undertake with its own staff and facilities, research conceived to meet the objectives of research described in Article II in the amount of value of approximately one-half of the funds allocated to the Program for research. The other half of the funds allocated to the Program shall be made available under separate agreements supporting research proposed by member educational institutions and which meet the objectives of the Consortium described in Article II.
2. Furnish annually to the Executive Committee of the Consortium, as early in the fiscal year as reasonable assurance can be given, the approximate amount of funds that will be available that year for research grants that meet the objectives of the Consortium.
3. Designate a representative to serve full time on the Executive Committee of the Consortium for continuing liaison and coordination of the entire Urban Forest Research Program.
4. Provide logistical support in the form of secretarial and office services and supplies to the Consortium within the limits imposed by the funds and personnel administratively determined to be available for this purpose.
5. Participate fully with members of the Consortium in research problem identification and selection and research program formulation for both university and in-house research.
6. Share the cost of Consortium publications as appropriate and mutually agreed in each case.
7. Serve, participate, and contribute to all Consortium activities as mutually agreed upon by the Consortium as a whole, and to the extent permitted by Federal laws and regulations.

B. Each member Educational Institution agrees to:

1. Participate fully within the Consortium in research problem formulation for both university and Forest Service in-house research.
2. Serve and participate in all Consortium activities as mutually agreed upon by the Consortium as a whole.
3. Fund the cost of sending representatives to Working Group meetings and other committee meetings agreed to by the Consortium. Travel policies of each institution shall control its official representative or alternate; each institution shall pay only for its own representative.
4. Publish or arrange for publishing appropriate results of the research sponsored through the Consortium and conducted by a member of the institution, according to the policies and practices of the educational institution concerned and giving due credit to the Urban Forest Research Program.
5. Share the cost of general Consortium publications as appropriate and mutually agreed in each case.

ARTICLE V. *Organization*

A. *Consortium:*

Each member institution, including the Northeastern Forest Experiment Station, shall designate one official representative and one alternate representative to the Consortium. The alternate representative shall vote only in the absence of the official representative. An institution is not obliged to cause its alternate to attend any meetings unless its official representative does not attend. The alternate, however, is permitted to attend.

B. Officers:

The official representatives of the Consortium shall elect from their membership a president, a first vice-president, a vice-president for research, and a secretary-treasurer, each for a two-year term. The Forest Service representative shall not be eligible to serve as an officer.¹

The president shall be empowered to ratify decisions of the Executive Committee by executing instruments and other papers in the name of the Consortium. Other responsibilities and authorities of the officers not otherwise described in the Charter shall be proposed by the Executive Committee and become effective when adopted by amendment to the Charter or the bylaws.

C. Executive Committee:

The Executive Committee of the Consortium shall consist of the above four officers plus a member of the Forest Service appointed by the Director of the Northeastern Forest Experiment Station, plus nonvoting members as provided for in the bylaws.

The Executive Committee shall be empowered to handle the business and affairs of the Consortium and to appoint and assign duties to such standing and ad hoc committees as may be advisable. The Executive Committee is not empowered to bind any institution to make any payment of funds or render any services to the Consortium or any third party. Actions of the Executive Committee shall be consistent with this Charter and the votes of its members. A four-fifths majority of the Executive Committee is required to initiate any action.

D. Working Groups:

Research planning on technical aspects of urban forestry problems will be done through functional Working Groups made up of scientists from both member and non-member institutions. Each working group will develop a problem analysis that sets forth a series of research studies directed toward solution of high priority urban forestry research problems. Groups will submit research grant proposal packages to the Consortium according to established procedures.

ARTICLE VI. *Funding*

It is expected that the principal source of funds to support research planned by the Consortium will be Federal appropriations to the Forest Service, U.S. Department of Agriculture, available for this purpose. In addition, the Consortium will accept funds from other appropriate organizations, agencies, and foundations. All proposals for funds sought in the name of the Consortium will be reviewed by the Consortium Executive Committee, which will approve or disapprove them. Member institutions may seek funds individually, without review by the Executive Committee, if such funds are not sought in the name of the Consortium.

ARTICLE VII. *Operations*

A. Internal Administration

1. *Annual Meeting.* The Consortium shall meet at least once a year at a time and place decided by the Executive Committee to discuss research program direction and progress, research funding, and other matters as appropriate.
2. *Special Meetings.* Special meetings of the Consortium will be called by the President as needed. Committees will meet as required to carry out their responsibilities.
3. *Working Group Meetings.* Periodic meetings to plan and coordinate Working Group activities, as called by the Working Group chairman with the concurrence of the president.
4. *Voting.* Each member institution shall have one vote in the Consortium.
5. *Quorum.* Official or alternate representatives from two-thirds of the member institutions shall constitute a quorum for conducting the business of the Consortium. When a quorum is present, a two-thirds majority of the representatives or their alternates present and voting shall be required for initiation or approval of any action, unless otherwise specified in the Charter.

¹The Forest Service representative was more commonly known as the Program Coordinator.

B. Research

The Consortium will:

1. Identify and select specific research problems to be pursued under the Consortium program of Environmental Forestry Studies. It may determine and set the objectives, priorities and guidelines for studies, based on its interpretation of public need, funds available, capabilities of institutions and persons, and other work under way within or outside the Consortium.
2. Solicit and entertain Working Group research proposal packages containing integrated study grant proposals that are submitted through the Working Group by scientists from both member institutions and non-member institutions which desire to participate and which have the capability to contribute appropriately to the solution of the research problems selected for study.
3. Evaluate all research proposals submitted to it for which grant funds are requested and select those deemed most appropriate and feasible for contributing to solution of the research problems and priorities it has set.
4. Forward the grant proposals it has selected for Forest Service financing (within the limits of funds expected to be available) to the Director of the Northeastern Forest Experiment Station together with its recommendations, by priorities, for their financing through Forest Service research agreements. Such grants will be subject to usual Forest Service review procedures and legal restrictions.
5. Allocate non-Forest Service funds that may be available. Such funds shall be used to finance additional research proposals, or for other purposes; but the allocation shall be for the purposes intended by the contributor of the funds.
6. Review and evaluate periodically the accomplishments of the research conducted under its aegis.

C. Information Exchange

The Consortium will:

1. Arrange for printing and distributing such publications and reports as it deems appropriate. Costs will be shared equally among member institutions unless otherwise unanimously agreed, or paid from Consortium funds that may be available for this purpose.
2. Sponsor seminars, conferences, symposia, and other meetings from time to time to coordinate research in Environmental Forestry, to instruct and educate, and to disseminate results of the research. Costs of such meetings will be shared equally among Consortium members, unless unanimously agreed, paid for from Consortium funds, or otherwise discharged as appropriate in each instance. Forest Service contribution to such costs is subject to Federal laws and regulations.
3. Seek to gain public understanding and support for the role of Environmental Forestry and Environmental Forestry Research and their influences through social and ecological relationships in attaining an improved human environment.

ARTICLE VIII.

Adoption and Amendment of Charter and Bylaws

- A. *Adoption of Charter.* The Consortium shall take effect February 1, 1971 and continue until dissolved by a majority vote of its members at the time. Institutions shall become members on the date the Charter is signed below by their authorizing official.
- B. *Charter Amendments.* Each proposed revision or amendment of this charter must be sponsored by at least three members of the Consortium and submitted to the Executive Committee two months in advance of any Consortium meeting (annual or special) at which the proposal is to be discussed. The Executive Committee will send a copy of the proposal to each member institution at least 30 days in advance of the meeting at which discussion will be held on the proposal, together with notification of the time and place of the meeting. After discussion of the proposal at the meeting, member institutions will vote on the proposal by mail ballot. Approval by two-thirds of the member institutions will be necessary for adoption.
- C. *Bylaws.* As the need arises, Bylaws of the Consortium, and their revisions and amendments, will be developed by the Executive Committee, which will submit them to the official representatives of the member institutions in the Consortium for approval or disapproval. Such Bylaws, revisions, or amendments shall be consistent with the Charter and will become effective 30 days following the date of submission unless one-third of the Consortium members disapprove in writing before that time.
- D. *Signatures.*

**BYLAWS OF THE CONSORTIUM
FOR ENVIRONMENTAL FORESTRY STUDIES**
(Article numbers refer to the Charter)

Bylaw for Article III: Admitting new members

An educational institution that wishes to become a member of the Consortium shall submit a letter to the President, briefly describing the research programs and availability of competent scientists at that institution to work within the scope of Consortium research objectives. The President will request the Forest Service Representative and at least one other member of the Executive Committee to visit the institution and to confirm that there is both top administrative support and a focus of interest for Consortium research activities among a group of interested and qualified scientists at the non-member institution. A four-fifths majority of the Executive Committee shall be required before a non-member institution can be proposed for membership. A vote conducted of representatives at the annual meeting of the Consortium, or a mail ballot, will be used for accepting or rejecting prospective members. Approval shall be required by two-thirds of the voting members of the Consortium.

Bylaw for Article V.B: Election of officers and duties of office

1. The nominating committee for election of officers shall be composed of the president and first vice-president, who shall contact prospective nominees to determine if individuals are willing to serve if elected. Elections shall be held for president and secretary-treasurer on alternate years to the election for the first vice-president and vice-president for research.
2. A mail ballot will be conducted by the secretary-treasurer during April of each year. New officers will assume their duties on July 1 of the same year and serve until June 30, two years hence.
3. Should an elected officer resign or vacate the office, the Executive Committee will nominate a slate of at least two candidates and conduct a mail ballot to fill the vacancy.

The President, in addition to the duties already described in Article V.B, shall:

1. Represent the Consortium at official functions and meetings.
2. Conduct the meetings of the Consortium.
3. Appoint various committees to conduct the business of the Consortium.
4. Develop the agenda for meetings of the Consortium or its Executive Committee.
5. Prepare at the end of his term in office an annual report of Consortium activities and accomplishments.

The First Vice-President shall:

1. Function in place of the president if and when necessary.
2. Whenever requested, assist the President in the development and conduct of Executive Committee work.

The Vice-President for Research shall:

1. Develop procedures for submitting and evaluating research proposals.
2. Review research proposals submitted to the Consortium and provide the Executive Committee with a ranking based on the scientific merit of the proposal. In carrying out this review, he shall consult with research scientists from within or without the Consortium.
3. Assist the President, upon request, in the conduct of Consortium business.

The Secretary-Treasurer shall:

1. Record and distribute to representatives, minutes of meetings of the Consortium and the Executive Committee.
2. Maintain essential financial records on all funds received or disseminated in the name of the Consortium. He shall be bonded to handle such funds. (Forest Service funds for specific projects will be distributed directly to member institutions, without the Consortium secretary-treasurer having responsibility.)
3. Conduct any necessary mail ballots at the direction of the president.

The Forest Service representative shall:

1. Assist members of the Executive Committee, at their request, in the management of all Consortium activities.

2. Coordinate the in-house Forest Service research phase of the Pinchot Institute with Consortium activities and research.

Bylaw for Article V, D: Working Groups¹

Establishment of Working Groups

Working groups may be established by petition. Petitions should include a definition of the subject matter area, documentation of the need for the new group, and a list of the petitioners by name and institution. Petitions should be submitted to the Executive Committee by the annual deadline for submitting research proposals. The Executive Committee will solicit comments on the petition at the annual meeting of technical reviewers and will vote at its winter meeting whether to recommend the petition for approval at the next annual meeting of the Consortium.

Appointment of Working Group Chairmen

Working Group Chairmen shall be appointed by the Executive Committee. Nominations for Working Group chairmen may be submitted to the Executive Committee by any Consortium representative or alternate or by any member of any Working Group. Newly appointed chairmen will take office at the annual meeting of the Consortium.

This section shall become effective at the 1979 Executive Committee meeting, at which time half the Working Group chairmen shall be appointed (or reappointed) for a one-year term and half for a two-year term. Thereafter terms shall be for two years.

Termination of Working Groups

Working Groups may be terminated by vote of the Consortium at its annual meeting.

¹As approved, December 1978.

APPENDIX TWO: Revised Charter of the Consortium for Environmental Forestry Studies¹

ARTICLE I. Name and Location

The name of this consortium shall be CONSORTIUM FOR ENVIRONMENTAL FORESTRY STUDIES. First chartered in 1971, the Consortium was rechartered in 1983 under the same name. The principal office shall be at the Forest Service, U.S. Department of Agriculture, Northeastern Forest Experiment Station, Upper Broomall, Pennsylvania.

ARTICLE II. Purpose

This nonprofit Consortium is formed to initiate, support, and carry out programs of research, education, and technology transfer relating to the urban-forest interface in the Megalopolis of the northeastern United States; to establish, maintain, and operate such facilities as may be needed to carry out these missions; to publish and otherwise disseminate the results of research; and to carry out other activities as needed in furthering these endeavors.

Research will include, but is not limited to, the following general areas:

1. Improving decision making and planning models involving social, economic, biological, and ecological analysis of forest resources in areas of constantly increasing human pressures.
2. Increasing the amenities provided by forest resources.
3. Improving the management of forested municipal watersheds for urban water supplies, recreation, and other uses.
4. Genetic improvement of intensively used forest vegetation.
5. Site requirements for landscape tending.
6. Improving wildlife habitat for spectator enjoyment, with emphasis on nongame species.
7. Improving the social well-being of urban people through recreation and aesthetics in a forest environment.
8. Improving the management of urban-forest ecological systems.
9. Improving the protection of high-value forest vegetation from destructive actions of man and other agents.
10. Improving urban highways and intersections with forest vegetation.
11. Improving urban man's understanding of his interrelationships with, and determining his needs for, urban forest environments.
12. Improving social institutions and arrangements for using forest resources to improve urban environments.

ARTICLE III. Membership

The Consortium for Environmental Forestry Studies shall be composed of the Northeastern Forest Experiment Station, Forest Service, U.S. Department of Agriculture, and selected institutions, corporations, organizations, and government agencies throughout the northeastern United States. Under the original Charter in 1971, the charter education institutions were:

The Cornell University, Ithaca, New York;
The Pennsylvania State University, University Park, Pennsylvania.
Princeton University, Princeton, New Jersey;
Rutgers University, New Brunswick, New Jersey;
State University of New York College of Environmental
Science and Forestry, Syracuse, New York;

¹As revised and rechartered 8 June 1983, at the Consortium Annual Meeting, Durham, New Hampshire.

University of Connecticut, Storrs, Connecticut;
 University of Massachusetts, Amherst, Massachusetts;
 University of New Hampshire, Durham, New Hampshire; and
 Yale University, New Haven, Connecticut.

Under the revised Charter in 1983, the charter institutions shall be:

The Cornell University, Ithaca, New York;
 The Ohio State University, Columbus, Ohio;
 The Pennsylvania State University, University Park, Pennsylvania.
 Rutgers University, New Brunswick, New Jersey;
 State University of New York College of Environmental
 Science and Forestry, Syracuse, New York;
 University of Connecticut, Storrs, Connecticut;
 University of Delaware, Newark, Delaware;
 University of Massachusetts, Amherst, Massachusetts;
 University of New Hampshire, Durham, New Hampshire;
 University of Vermont, Burlington, Vermont;
 Yale University, New Haven, Connecticut.

Other institutions shall apply for membership and be admitted to the Consortium according to the procedures given in the Bylaws.

The membership categories and their composition are listed below:

<u>Founding Sponsor:</u>	Northeastern Forest Experiment Station, Forest Service, U.S. Department of Agriculture.
<u>Participating Member:</u>	Participating members will include, but are not limited to, arboreta, botanical gardens, colleges, educational centers, horticultural societies, research centers, and universities. They will be institutions or organizations which conduct research and/or have active education programs conducted by resident staff. Participating members' staffs could be expected to submit research and/or education proposals to the Consortium to be considered for funding.
<u>Sponsoring Member:</u>	Sponsoring members will include, but are not limited to, associations, Chambers of Commerce, corporations, government agencies, foundations, municipalities, nurseries, and utility companies. They will be institutions, corporations, organizations, or agencies which may or may not have active research or education programs and whose primary objective is to support research or education proposals in urban and community forestry. Staff of sponsoring members will not generally be expected to submit proposals to the Consortium to be considered for funding.

Forest Service membership shall continue as long as the companion Cooperative Agreement between the Forest Service and the Consortium remains in force. Other members may resign at any time by giving 90 days written notice to the Consortium.

ARTICLE IV. Obligations of Member Institutions

- A. Northeastern Forest Experiment Station, Forest Service, U.S. Department of Agriculture, agrees to:
1. Provide funding as permitted by Congress and appropriate budget authorities for the purpose of undertaking research described in Article II within the framework of the Urban Forest Research Program.
 2. Furnish annually to the Executive Committee of the Consortium, as early in the fiscal year as reasonable assurance can be given, the approximate amount of funds that will be available that year for research grants that meet the objectives of the Consortium.

3. Designate a representative to serve full time on the Executive Committee of the Consortium for continuing liaison and coordination of the entire Urban Forest Research Program.
 4. Provide logistical support in the form of secretarial and office services and supplies to the Consortium within the limits imposed by the funds and personnel administratively determined to be available for this purpose.
 5. Participate fully with members of the Consortium in research problem identification and selection and research program formulation for both institution and in-house research.
 6. Share the cost of Consortium publications as appropriate and mutually agreed in each case.
 7. Serve, participate, and contribute to all Consortium activities as mutually agreed upon by the Consortium as a whole, and to the extent permitted by Federal laws and regulations.
- B. Each other member agrees to:
1. Participate fully within the Consortium in problem analysis and project formulation.
 2. Serve and participate in all Consortium activities as mutually agreed upon by the Consortium as a whole.
 3. Fund the cost of sending representatives to Working Group meetings and other committee meetings agreed to by the Consortium. Travel policies of each institution shall control its official representative or alternate; each institution shall pay only for its own representative.
 4. Publish or arrange for publishing appropriate results of the research sponsored through the Consortium and conducted by a member of the institution, according to the policies and practices of the institution concerned and giving due credit to the Urban Forest Research Program.
 5. Share the cost of general Consortium publications as appropriate and mutually agreed in each case.
- C. The participating and sponsoring members agree to contribute funds, other sources, or "in kind" services as described in the Bylaws.

ARTICLE V. Organization

- A. Consortium:
- Each member institution, including the Northeastern Forest Experiment Station, shall designate one official representative and one alternate representative to the Consortium. The alternate representative shall vote only in the absence of the official representative. An institution is not obliged to cause its alternate to attend any meetings unless its official representative does not attend. The alternate, however, is permitted to attend.
- B. Officers:
- The official representatives of the Consortium shall elect from their membership a President and a Secretary-Treasurer. In addition, the official representatives of the participating members shall elect from their membership Vice President for Program, and the official representatives of the sponsoring members shall elect from their membership a Vice President for Development. The Forest Service representative shall not be eligible to serve as an elected officer.
- The President shall be empowered to ratify decisions of the Executive Committee described below by executing instruments and other papers in the name of the Consortium. Other responsibilities and authorities of the officers not otherwise described in the Charter shall be proposed by the Executive Committee and become effective when adopted by amendment to the Charter or the Bylaws.
- C. Executive Committee:
- The Executive Committee of the Consortium shall consist of the above four officers plus a member of the Forest Service appointed by the Director of the Northeastern Forest Experiment Station, plus nonvoting members as provided for in the bylaws.
- The Executive Committee shall be empowered to handle the business and affairs of the Consortium and to appoint and assign duties to such standing and ad hoc committees as may be advisable. The Executive Committee is not empowered to bind any institution to make any payment of funds or render any services to the Consortium or any third party. Actions of the Executive Committee shall be consistent with this Charter and the votes of its members. A four-fifths majority of the Executive Committee is required to initiate any action.

D. Working Groups:

Research planning on technical aspects of urban forestry problems will be done through functional Working Groups made up of scientists from both member and non-member institutions. Each Working Group will develop a problem analysis that sets forth a series of research studies directed toward solution of high priority urban forestry research problems. Working Groups will submit research grant proposal packages to the Consortium according to established procedures.

ARTICLE VI. Funding

It is anticipated that a continuing source of funds to support program and administration activities will be federal appropriations to the Forest Service, U.S. Department of Agriculture. Additional funds will be provided by sponsoring members, and as appropriate, by participating members. The Consortium will also seek and accept funds from foundations and other institutions. Proposals for such funds sought in the name of the Consortium will be reviewed and approved or disapproved by the Executive Committee. Member institutions may seek funds under their own name without review or approval by the Executive Committee.

ARTICLE VII. Operations

A. Internal Administration

1. Annual Meeting. The Consortium shall meet at least once a year at a time and place decided by the Executive Committee to discuss research program direction and progress, research funding, and other matters as appropriate.
2. Special Meetings. Special meetings of the Consortium will be called by the President as needed. Committees shall meet as required to carry out their responsibilities.
3. Executive Committee Meetings. Executive Committee meetings shall be called by the President as needed.
4. Working Group Meetings. Periodic meetings to plan and coordinate Working Group activities, as called by the Working Group chairman with the concurrence of the president, shall be held.
5. Voting. Each member institution shall have one vote in the Consortium.
6. Quorum. Official or alternate representatives from two-thirds of the member institutions shall constitute a quorum for conducting the business of the Consortium. When a quorum is present, a two-thirds majority of the representatives or their alternates present and voting shall be required for initiation or approval of any action, unless otherwise specified in the Charter.

B. Research

The Consortium will:

1. Identify and select specific research problems to be pursued under the Consortium program of Environmental Forestry Studies. It may determine and set the objectives, priorities, and guidelines for studies, based on its interpretation of public need, funds available, capabilities of institutions and persons, and other work under way within or outside the Consortium.
2. Solicit and entertain Working Group research proposal packages containing integrated study grant proposals that are submitted through the Working Group by scientists from both member institutions and nonmember institutions which desire to participate and which have the capability to contribute appropriately to the solution of the research problems selected for study.
3. Evaluate all research proposals submitted to it for which grant funds are requested and select those deemed most appropriate and feasible for contributing to solution of the research problems and priorities it has set.
4. Forward the grant proposals it has selected for Forest Service financing (within the limits of funds expected to be available) to the Director of the Northeastern Forest Experiment Station together with its recommendations, by priorities, for their financing through Forest Service research agreements. Such grants will be subject to usual Forest Service review procedures and legal restrictions.
5. Allocate non-Forest Service funds that may be available. Such funds shall be used to finance additional research proposals, or for other purposes; but the allocation shall be for the purposes intended by the contributor of the funds.
6. Review and evaluate periodically the accomplishments of the research conducted under its aegis.

C. Information Exchange

The Consortium will:

1. Arrange for printing and distributing such publications and reports as it deems appropriate. Costs will be shared equally among member institutions unless otherwise unanimously agreed, or paid from Consortium funds that may be available for this purpose.
2. Sponsor seminars, conferences, symposia, and other meetings from time to time to coordinate research in Environmental Forestry, to instruct and educate, and to disseminate results of the research. Costs of such meetings will be shared equally among Consortium members, unless unanimously agreed, paid for from Consortium funds, or otherwise discharged as appropriate in each instance. Forest Service contribution to such costs is subject to Federal laws and regulations.
3. Seek to gain public understanding and support for the role of Environmental Forestry and Environmental Forestry Research and their influences through social and ecological relationships in attaining an improved human environment.

ARTICLE VIII.

Adoption and Amendment of Charter and Bylaws

- A. Adoption of Charter and Bylaws. The Charter¹ and Bylaws¹ of the Consortium shall take effect July 1, 1983 and shall remain in force until amended or until the Consortium is dissolved. Each institutions shall become a charter¹ member on the date the Charter is signed by its authorizing official.
- B. Charter Amendments. Each proposed revision or amendment of this Charter must be sponsored by at least three members of the Consortium and submitted to the Executive Committee two months in advance of any Consortium meeting (annual or special) at which the proposal is to be discussed. The Executive Committee will send a copy of the proposal to each member institution at least 30 days in advance of the meeting at which discussion will be held on the proposal, together with notification of the time and place of the meeting. After discussion of the proposal at the meeting, member institutions will vote on the proposal by mail ballot. Approval by two-thirds of the member institutions will be necessary for adoption.
- C. Bylaws. As the need arises, Bylaws of the Consortium, and their revisions and amendments, will be developed by the Executive Committee, which will submit them to the official representatives of the member institutions in the Consortium for approval or disapproval. Such Bylaws, revisions, or amendments shall be consistent with the Charter and will become effective 30 days following the date of submission unless one-third of the Consortium members disapprove in writing before that time.
- D. Signatures.

¹As revised on June 8, 1983, at the Annual Meeting, Durham, New Hampshire.

**BYLAWS OF THE CONSORTIUM
FOR ENVIRONMENTAL FORESTRY STUDIES**
(Article numbers refer to the Charter)

Bylaw for Article III: Admitting New Members

An institution or organization that wishes to become a participating member of the Consortium shall submit a letter to the President, briefly describing its research and/or education programs and availability of competent personnel at that institution to work within the scope of Consortium research and/or education objectives. The President will request the Forest Service Representative and at least one other member of the Executive Committee to visit the institution and to confirm that there is both top administrative support and a focus of interest for Consortium research activities among a group of interested and qualified personnel at the nonmember institution. A four-fifths majority of the Executive Committee shall be required before a nonmember institution can be proposed for membership. A vote conducted of representatives at the annual meeting of the Consortium, or a mail ballot, will be used for accepting or rejecting prospective members. Approval shall be required by two-thirds of the voting members of the Consortium.

An institution, corporation, organization, or agency that wishes to become a sponsoring member of the Consortium shall submit a letter to the President, briefly describing the reason it wishes to join the Consortium and what level of support it is willing to offer the Consortium. A four-fifths majority vote of the Executive Committee shall be required to accept new sponsoring members.

Following an affirmative vote by the members, as aforesaid, the President is empowered to extend an official membership invitation, by letter, the acceptance and acknowledgement of which shall entitle the applicant to membership privileges and obligations to the same extent as in the case of Charter members. The signed and acknowledged acceptance letter shall operate as an agreement on the part of the applicant to all terms and conditions contained in the Charter and bylaws at the time of execution and said letter shall be made a part of the official records of the Consortium.

Bylaw for Article IV.C: Participating and Sponsoring Members

Participatory members are expected to contribute either \$500 in annual monetary support, resources, or "in kind" services. Qualifying resources include donations of supplies, meeting space, printing costs, or other resources which shall be evaluated for worth by the Executive Committee. "In kind" services include staff time for participation as Executive Committee members, working group chairmen, or on other committees as deemed necessary and as evaluated by the Executive Committee.

Sponsoring members are expected to contribute money or resources in one of the following three categories:

Supporting:	Provides \$500 per year;
Sustaining:	Provides \$501 to \$5,000 per year;
Promoting:	Provides more than \$5,000 per year.

Bylaw for Article V.B: Election of Officers and Duties of Office

1. The nominating committee for election of officers shall be appointed by the Executive Committee, who shall contact prospective nominees to determine if individuals are willing to serve if elected. Elections shall be held for President and Secretary-Treasurer on alternate years to the election for the Vice-President for Program and Vice President for Development.
2. A mail ballot will be conducted by the Secretary-Treasurer during April of each year. New officers will assume their duties on July 1 of the same year and serve until June 30, two years hence.
3. Should an elected officer resign or vacate the office, the Executive Committee will nominate a slate of at least two candidates and conduct a mail ballot to fill the vacancy.

The President, in addition to the duties already described in Article V.B, shall:

1. Represent the Consortium at official functions and meetings.
2. Conduct the meetings of the Consortium.
3. Appoint various committees to conduct the business of the Consortium.
4. Develop the agenda for meetings of the Consortium or its Executive Committee.
5. Prepare at the end of his term in office an annual report of Consortium activities and accomplishments.

The Vice President for Program shall:

1. Function in place of the president if and when necessary.
2. Whenever requested, assist the President in the development and conduct of Executive Committee work.

The Vice President for Development shall:

1. Oversee fund-raising activities of the Consortium
2. Assist the President, upon request, in the conduct of Consortium business.

The Secretary-Treasurer shall:

1. Record and distribute to representatives, minutes of meetings of the Consortium and the Executive Committee.
2. Maintain essential financial records on all funds received or disseminated in the name of the Consortium. He shall be bonded to handle such funds. (Forest Service funds for specific projects will be distributed directly to member institutions, without the Consortium Secretary-Treasurer having responsibility.)
3. Conduct any necessary mail ballots at the direction of the president.

The Forest Service Representative shall:

1. Assist members of the Executive Committee, at their request, in the management of all Consortium activities.
2. Coordinate the in-house Forest Service research phase of the Urban Forest Research Program with Consortium activities and research.

Bylaw for Article V.C: Executive Committee

The Executive Committee shall work with people from cooperating member institutions to generate a two-fold fundraising strategy that will aim to: 1. strengthen and expand the Consortium membership; and 2. supplement the funds allotted from the Northeastern Forest Experiment Station. This fund-raising effort will be sensitive to the individual fund-raising campaigns of the Consortium members and will solicit grants and contributions primarily through agencies or programs whose goal is to support multi-discipline and multi-institutional endeavors.

The Executive Committee and the Northeastern Forest Experiment Station shall appoint an Executive Secretary who will serve as the program manager for the Consortium. The Executive Secretary shall serve as a nonvoting member of the Executive Committee.

Bylaw for Article V. D: Working Groups

Establishment of Working Groups

1. Working groups may be established by petition. Petitions should include a definition of the subject matter area, documentation of the need for the new group, and a list of the petitioners by name and institution. Petitions should be submitted to the Executive Committee who will solicit comments on the petition and will vote at its winter meeting whether to recommend the petition for approval at the next annual meeting of the Consortium.

Appointment of Working Group Chairmen

1. Working Group Chairmen shall be appointed by the Executive Committee. Nominations for Working Group chairmen may be submitted to the Executive Committee by any Consortium representative or alternate or by any member of any Working Group. Newly appointed chairmen will take office at the annual meeting of the Consortium.

This section shall become effective at the 1979 Executive Committee meeting, at which time half the Working Group chairmen shall be appointed (or reappointed) for a one-year term and half for a two-year term. Thereafter terms shall be for two years.

Termination of Working Groups

1. Working Groups may be terminated by vote of the Consortium at its annual meeting.

Proposed Duties of the Advisory Board

1. Display an active interest in the use and management of vegetation in urban and community environments to improve the quality of life for persons living and working there.
2. Have or develop contacts with persons who make decisions, or can influence the making of decisions, which affect the use of vegetation in urban and community environments.
3. Meet with the Executive Committee of the Consortium once each year, at the annual meeting.
4. Discuss with the Executive Committee concerns regarding development of funding to conduct such research, and the philosophy guiding the Consortium program.
5. Through personal or business contacts, increase awareness of the Consortium's capabilities, expertise, and accomplishments.

Proposed Duties of the Executive Director

1. Serve as Secretary to the Executive Committee of the Consortium and to the Consortium Advisory Board.
2. Manage fund raising activities on behalf of the Consortium as directed by the Executive Committee.
3. Organize and manage the submission and evaluation of all research proposals for the Executive Committee.
4. Coordinate and expedite the funding of research proposals recommended for support by the Executive Committee.
5. Prepare and distribute the Consortium newsletter and such other materials as shall be approved by the Executive Committee.
6. Maintain a tracking process for grants and agreements and arrange for appropriate technical monitoring of the performance of each grantee or Cooperator.
7. Prepare and submit required reports to the Executive Committee and to the Northeastern Forest Experiment Station.
8. Coordinate urban forestry research and application efforts among Consortium members.

APPENDIX THREE: Procedures for Submitting Individual Research Proposals

Cover Sheet: Study title, principal investigator(s), institution, proposed starting date, duration, total budget estimate, official university signature.

Table of Contents:

- I. Abstract (single page)
 - Brief** statement of problem, justification, objective(s), plan of research, relation of study to Consortium and working group objectives, and other proposals in package.
- II. Budget Sheet
- III. The Study Problem:
 - A. Statement of problem (background). Review of relevant literature — previous work, problem identification, and justification.
 - B. Relationship to Pinchot Consortium objectives.
 - C. Relationship to working group research program and other proposals.
 - D. Usefulness of results: identify users and benefits from the proposed research.
- IV. Statement of Study Objectives
- V. Study Methods:
 - Study design — variables measured, sampling, data collection procedures
 - Method of analysis
 - Field and laboratory methods and schedule
- VI. Literature Cited
- VII. Principal Investigator(s) Vita
- VIII. Appendix (as appropriate)

APPENDIX FOUR: Procedures for Submitting Working Group Research Proposal Packages

ORIGIN OF PROPOSAL

I. From Consortium Member Institutions

- A. Packaged proposals from working groups or proposals related to a completed problem analysis.
- B. Proposals submitted independent of working groups.

A scientist from a Consortium member institution can submit proposals independent of working groups only if the proposal is not related to the scope of activities encompassed by one of our nine groups. The Consortium Executive Committee will entertain no more than two such proposals per member institution. Independent proposals will not exceed a total budget of \$10,000. No more than three such independent proposals will be funded annually.

II. From Non-Consortium Institutions

Scientists from non-Consortium institutions can submit proposals through Consortium working group chairmen. If selected, funding will go directly to the institution. Such proposals must be related to and coordinated with Consortium working group activities.

ORGANIZATION OF WORKING GROUP PROPOSAL PACKAGES

Whether from working groups with completed problem analyses or from those who have not yet completed their problem analyses, an organized program package will help facilitate technical review of proposals and policy review by the Executive Committee. The following outline will help accomplish this organization.

- I. Cover Sheet — Name of working group, name of working group co-chairmen.
- II. Table of Contents
- III. Research Plan
For working groups who have not completed problem analyses: provide a general statement on problems addressed by the working group, priorities for studies, and a general research program schedule. For working groups with a problem analysis: reviewers will have the source document available and hence detailed information need not be included in the package unless so desired. Appropriate references to the problem analysis should be sufficient.
- IV. Annual Report of the Working Group
A summary of working group accomplishments since last proposal package was submitted. Must include the following:
 - a. List of active participants
 - b. List of meetings held
 - c. List of working group publications that are directly related to Pinchot Institute grants. Identify future publications by research grant number
 - d. Brief statement of future plans for development of the working group

V. Introduction to Proposals

A brief statement indicating the links between the proposed working group program of research and/or problem analysis (Interim Research Plan) and Pinchot goals and objectives (inter-disciplinary, inter-institutional, environmental forestry, metropolitan forestry, etc.). This is where areas not covered in a problem analysis or where deviations from research priority should be discussed.

VI. Proposals

Provide a list of individual proposals. Follow proposal outline in preparing individual proposals. Note that each proposal must be a separate document.

APPENDIX FIVE: Research Proposal Technical Review Form¹

Title: _____

Principal Investigator: _____ Date: _____

Please read the proposal. Then rate each attribute listed below with a value between 1 and 5: 1 is low or poor, 5 is high or excellent. Space is provided for comments below each criteria.

0=unacceptable or not present

1=low or poor

2=below average

3=OK or average

4=above average

5=excellent high

Generate a score by multiplying each rating by its weight "f".

ATTRIBUTE	RATING	x	f	=	SCORE
1. Degree to which the proposal demonstrates the PI's knowledge of the field(s). Does the PI know what he/she is doing?	()	x	4	=	()
2. Technical Quality					
a. Are objectives and research plan clear?	()	x	1	=	()
b. Are procedures to be used adequate? This does not relate to how well the proposal is written but rather to the question of appropriateness and adequacy of methods. Specifically, consider experimental design, experimental methods, and data reduction. (Assign one rating only.)	()	x	3	=	()
3. Overall quality of the proposal. Is it well written? Are procedures well described? Do you know what the PI is going to do?	()	x	2	=	()
TOTAL SCORE					_____

¹As the Consortium expanded both in size and scope, it required an increasingly sophisticated review process for proposals. Hence the above review form, just like the entire review process itself, was the product of almost a decade of trial and error.

BUDGET ANALYSIS.

Is the budget about right for the proposed work?

Yes ()

No ()

If not, why?

Please comment on this proposal's importance. Specifically, in what ways will this work advance science?

Please comment on the potential payoff of the proposed work. In what ways will this work advance the practice of urban forestry?

OVERALL SUMMARY OF PROPOSAL

In your view, the Consortium should:

() Accept proposal

() Reject proposal

COMMENTS

Your name: _____

Date: _____

Signature: _____

APPENDIX SIX: Consortium Grants

Institutions

Conn — University of Connecticut
 Cornell University
 Delaware University
 NH — University of New Hampshire
 Mass — University of Massachusetts
 ESF — SUNY College of Environmental
 Science and Forestry
 OSU — Ohio State University
 Penn — Pennsylvania State University
 Princeton University
 Rutgers University
 University of Vermont
 Yale University
 OT — Non-affiliated institutions

Working Groups

AQ — Air Quality
 AM — Amenities
 Genetics
 I&D — Insects and Disease
 IN — Independent
 P&M — Planning and Management
 S&B — Social and Behavioral Issues
 Soils
 Water
 Wildlife
 Other: TT — Technology transfer
 Admin — Administration

Principal Investigator	Project Title	Working Group	Institution	Amount

1971				
Schaedle, M.	Carbon monoxide circulation in plant ecosystems	AQ	ESF	16,500
Herrington, L.	Analysis of sound attenuation by trees and associated vegetation	AM	ESF	7,000
Sopper, W.	Effects of municipal wastewater disposal on the forest ecosystem	Water	Penn	16,200
Worrell, A.	A critical analysis of forest and other open land policy formation in the northeastern urban fringe area	P&M	Yale	16,498.50
Leonard, R.	Potential role of easements in expanding opportunities for urban people to enjoy the forest environment	P&M	Conn	12,000
Hall, O.	Improving the human environment in the urban-forest interface of the Northeast	AM	NH	8,900

1972

Dindal, D.	Effects of recycling sewage effluent and sludge on soil invertebrate populations	Water	ESF	11,290
Gerhold, H.	Genetics of conurban trees	Genetics	Penn	29,100
Estes, G.	Bark-sewage composting experiment	Soils	NH	24,800
Forman, R.	Size and urbanization as stresses on forest "island" ecosystem	Wildlife	NH	29,200
Fabos, J.	Metropolitan Landscape Planning Model	S&B	Mass	25,000
Miller, D.	Microclimate and energy transfer in the urban-forest interface	AM	Conn	29,325
Wilkins, B.	Implications, use, and ownership of non-farm rural land in central New York	P&M	Cornell	26,200

1973

Kennard, W.	Investigation of Pinchot Institute research needs	Admin	Conn	12,000
Miller, D.	The effects of forest vegetation on microclimate within the metropolitan complex	AM	Conn	15,392
Routley, D.	Applications of growth retardants in tree maintenance	P&M	NH	16,000
Hennigan, R.	Improving decision making policies and programs involving forest resources in areas of constantly increasing human pressures	P&M	ESF	16,000
Herrington, L.	Microclimate of suburban openings	AM	ESF	5,000
Herrington, L.	Influence of meteorological conditions and terrain on sound propagation over and through forest vegetation	AM	ESF	22,040
Herrington, L.	The effects of forest vegetation on microclimate within the metropolitan complex	AM	ESF	11,047
DeWalle, D.	The effects of forest vegetation on microclimate within the metropolitan complex	AM	Penn	11,345
Reethof, G.	The acoustic characteristics of forests	AM	Penn	18,575
Gerhold, H.	Propagating conifers for performance tests	Genetics	Penn	3,080
Gerhold, H.	Genetics of ozone and sulfur dioxide resistance	Genetics	Penn	6,853
Gerhold, H.	Resistance of deciduous clones to ozone sulfur dioxide, and mixtures	Genetics	Penn	24,821
Brennan, E.	Assessment of the impact of air pollution on trees in New Jersey	AQ	Rutgers	20,377

1974

Smith, W.	Influence of particulate metal air contaminants on foliar pathogens of urban trees	AQ	Yale	7,285
Brennan, E.	Impact of cultural developments and technology on trees in urban ecosystems	AQ	Rutgers	10,941
Damman, A.	Heavy metal concentrations in mosses and lichens as indicators of supply from atmosphere sources	AQ	Conn	14,050
Mader, D.	Impacts of land disturbance during urban development on tree root systems and vigor, and means of ameliorating the impacts	Soils	Mass	12,700
Holmes, F.	Interaction of salt injury with other injuries and infections of trees in metropolitan areas	Soils	Mass	7,000
Pell, E.	Spatial and spectral mapping of response of vegetation to air pollutants	AQ	Rutgers	4,851
Brock	Spatial and spectral mapping of response of vegetation to air pollutants	AQ	ESF	5,018
Gerhold, H.	Urban tree performance tests	Genetics	Penn	12,306
Leaf, A.	Salt tolerances of some trees in metropolitan areas	Soils	ESF	5,600
Sopper, W.	Cadmium problems associated with land disposal of urban wastewaters	Water	Penn	9,766
Gerhold, H.	Genetic variation in tree roots: tolerance of salt accumulation and uses in improving urban and forest trees	Genetics	Penn	6,756
Hart, R.	Symposium: Meaning of natural environments to children	S&B	OT	7,500
Stillman, C.	Symposium: Meaning of natural environments to children	S&B	Rutgers	11,500
Herrington, L.	Symposium: The metropolitan physical environment	AM	ESF	5,000
Gerhold, H.	Symposium: Selecting and breeding trees for metropolitan landscapes	Genetics	Penn	7,520
Larson, J.	Relationship of songbird density and diversity to characteristics of urban songbirds	Wildlife	Mass	3,400
Mawson, J.	Wastewood survey in Megalopolis	P&M	Mass	15,000
Hennigan, R.	State of the art and problem analysis for land use policy	P&M	ESF	10,000
Smith, W.	State of the art and problem analysis for air quality	AQ	Yale	10,000
Sopper, W.	State of the art and problem analysis for water quality and quantity	Water	Penn	10,000

1975

Breen	Data analysis: Children's symposium	S&B	OT	500
Adrian, D.	Modeling the impact of liquid wastes on groundwater quality in forests	Soils	Mass	20,100
Sopper, W.	Impact of forest cover removal on water quality	Water	Penn	47,000
Murphey, W.	Heavy metal ions removal from wastewater using forest residues	Water	Penn	8,591
Gutman, R.	Policy aspects of forest preservation and tree planting in residential environments	P&M	Princeton	14,531
Reethof, G.	Theoretical and experimental research on acoustic characteristics of forests	AM	Penn	24,600
George, J.	Urban wildlife systems	Wildlife	Penn	15,000
Pell, E.	Spatial and spectral mapping of response of vegetation to air pollutants	AQ	Penn	2,900
Sabadell, E.	Heavy metal ions removal from wastewater using forest residues	Water	Princeton	25,800
Cleary, R.	Modeling the impact of liquid wastes on groundwater quality in forests	Water	Princeton	19,500
Harrje, D.	The effect of coniferous tree windbreaks on reducing air infiltration losses in residential housing	AM	Princeton	12,340
Nathan, K.	Effects of suburban development on water quality	Water	Rutgers	26,000
Brennan, E.	Assessment of impact of air pollution on trees in New Jersey	AQ	Rutgers	9,500
Herrington, L.	The role of trees in outdoor urban amenity spaces	AM	ESF	12,650
Brock	Spatial and spectral mapping of response of vegetation to air pollutants	AQ	ESF	4,935
Smith, W.	Influence of particulate metal air contaminants on foliar pathogens of urban trees	AQ	Yale	8,700
Irland, L.C.	Impact of suburbanization on timber growing: An economic analysis	IN	Yale	7,700
Herrington, L.	Problem analysis for acoustics and microclimate	AM	ESF	2,000
Gerhold, H.	Problem analysis for genetics	Genetics	Penn	2,000
George, J.	Problem analysis for wildlife in urbania	Wildlife	Penn	2,000
Fabos, J.	Problem analysis for urban landscape and recreation	S&B	Mass	3,000
Smith, W.	Symposium travel	Admin	Yale	12,000

Breen	Children's symposium	S&B	OT	2,500
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1976

Thomas, J.	Consortium research planning	Admin	Penn	10,000
Mader, D.	Problem Analysis for urban soils	Soils	Mass	3,000
O'Hayre, A.	Modeling the variable source of hydrologic response on heterogeneous watersheds	Water	Yale	3,800
Herrington, L.	Determining the environmental impact of selected land-use development controls	P&M	ESF	10,500
Herrington, L.	Soil-plant-atmosphere water continuum in urban forests	AM	ESF	17,300
DeWalle, D.	Forest vegetation effects on home energy consumption	AM	Penn	21,300
Harje, D.	Optimum use of coniferous forests in reducing winter home energy consumption	AM	Princeton	11,900
Bond, R.	Use and management policies of municipal natural resource-based lands in Massachusetts	S&B	Mass	12,500
Wohlwill, J.	Perceived congruity of manmade elements in forested and other natural contexts	S&B	Penn	10,000
Fabos, J.	Developing an assessment process for northeastern forests visual absorption capabilities	S&B	Mass	9,600
Sopper, W.	Symposium: Wastewater and sludge disposal in forests and land reclamation	Water	Penn	7,000
Karnosky, D.	Improving air pollution tolerance of urban trees	Genetics	OT	19,000
Harper	Increasing effectiveness of municipal environmental conservation commissions in New York State	P&M	ESF	11,400
Steiner, K.	Provenance testing — gene testing for urban trees	Genetics	Penn	20,000
VanDruff, L.	Survey of small mammal populations	Wildlife	ESF	15,600
Carroll	Wood productivity and social opportunity of town forests in New Hampshire	P&M	NH	13,900
Manion, P.	Problem Analysis for urban forest insects and disease	I&D	ESF	2,000
Gerhold, H.	Feasibility of performance testing systems for tree cultivars in metropolitan environments	Genetics	Penn	12,000

1977

DeWalle, D.	Problem Analysis: Energy conservation and urban forests	AM	Penn	2,100
Twight, B.	Environmental attributes which contribute to satisfaction of urban forest park users	S&B	Penn	9,495
Twight, B.	Privacy preferences and their relationship to urban forest and park landscapes and design	S&B	Penn	6,503
Miller, D.	Transpiration by urban trees	AM	Conn	12,437
Nieswand, G.	Transfer of development rights: An early evaluation	P&M	Rutgers	9,245
Herrington, L.	Relationship between urban climate and urban forests	AM	ESF	6,438
Sopper, W.	Effects of chronic applications of municipal wastewater on forest ecosystems	Water	Penn	10,425
Feder, W.	Air pollution effect on reproductive potential of forest trees in the Northeast	IN	Mass	7,950
Morell, W.	Environmental regulations, land use decisions, and open space preservation, New Jersey pinelands	P&M	Princeton	9,079
DeWalle, D.	Effects of vegetation on home energy consumption	AM	Penn	9,238
Reethof, G.	Theoretical and experimental research on the use of forests for noise control	AM	Penn	12,533
Mader, D.	Effects of soil compaction and tree root excision on tree vigor and growth	Soils	Mass	13,900
George, J.	Environmental factors associated with urban birds	Wildlife	Penn	8,358
Steiner, K.	Resistance of pin oak and sweetgum to iron chlorosis	Genetics	Penn	10,195
Valentine, F.	Establishment of urban tree progeny test population: Norway and sugar maple	Genetics	ESF	13,500
Gerhold, H.	Landscape trees from other countries	Genetics	Penn	10,195
Orton, E.	Interspecifically hybridization of Dogwood	Genetics	Rutgers	17,431

1978

Adrian, D.	Greenhouse studies of the suitability of forests and soils in accepting sanitary landfill leachate	Soils	Mass	13,000
Black, P.	Parking lot impact on water quality in a suburban stream	Water	ESF	9,743

Brennan, E.	An appraisal of ozone damage to selected tree species in New Jersey	AQ	Rutgers	17,716
Craul, P.	Impact of parking lot runoff on urban soils	Soils	ESF	19,484
DeWalle, D.	Effect of coniferous tree shelter belt placement on air infiltration and energy consumption for space heating in a small trailer	AM	Penn	21,476
George, J.	Human attitudes toward urban wildlife	Wildlife	Penn	15,731
Karnosky, D.	Progeny tests of air pollution tolerance in <u>Acer</u> and <u>Fraxinus</u>	Genetics	OT	18,931
Twight, B.	Problem Analysis for recreation	S&B	Penn	8,772
Lanier, G.	Pheromone-baited trap trees for management of elm bark beetles and control of Dutch elm disease	I&D	ESF	16,346
Lynch, J.	Development of an efficient sampling scheme for monitoring non-point source pollution	Water	Penn	19,644
Manion, P.	Assessment of virus diseases in the urban tree population: Phase I	I&D	ESF	14,072
Reethof, G.	An analysis of the impact of forests on control of the urban acoustic environment	AM	Penn	11,933
Sopper, W.	Use of municipal wastewater for the establishment of urban energy forests	Water	Penn	21,456
Valentine, F.	Early testing for insect and disease resistance in urban trees	Genetics	ESF	16,688
Westfall, R.	Genetic fingerprinting in urban tree varieties	Genetics	ESF	7,400
Herrington, L.	Executive Secretary IPA Agreement	Admin	ESF	19,500
Herrington, L.	Symposium: National Urban Forestry Conference	TT	ESF	15,000
Lewis, A.	Consortium research and planning	Admin	ESF	16,000

1979

Manion, P.	Assessment of virus diseases in the urban tree population: Phase II	I&D	ESF	25,808
Leaf, A. and E. White	Soil moisture - N fertilization interactions on the growth and vigor of sugar maple trees in urban environments	Soils	ESF	24,454
Sopper, W.	Reclamation and revegetation of mined land using urban sludge	Water	Penn	22,624
George, J.	Publication of urban wildlife problem analysis	Wildlife	Penn	3,750
VanDruff, L.	Relationships between relative abundance of selected bird species and characteristics of metropolitan neighborhoods	Wildlife	ESF	16,840

Potts, D.	Evapotranspiration and drought stress in Norway and sugar maple	AM	ESF	25,812
Craul, P.	Water supplying capabilities of urban forest soils	Soils	ESF	16,075
Reethof, G. and O. McDaniel	Sound propagation through forests and over open terrain in the presence of micro-meteorological variations — Phase I	AM	Penn	23,581
George, J.	The role of feeding stations in managing nongame bird habitat in urban and suburban areas	Wildlife	Penn	16,818
Tzilkowski, W.	Evaluation of the optimal characteristics of municipal street trees for urban songbirds	Wildlife	Penn	24,188
Lynch, J.	A workshop — impact of forest management on municipal water supplies and the aquatic ecosystem	Water	Penn	3,986
Allen, G. and T. Stevens	Bias in the measurement of recreation benefits for urban-oriented camping facilities	S&B	Mass	13,560
Hayward, G.	Images of urban forests	S&B	Mass	18,173
Lassoie, J.	Field fumigation of hardwood seedlings using the linear gradient exposure method: technique development	AQ	Cornell	20,625
Ulrich, R.	Therapeutic effects of urban forests: the case of hospitals	S&B	Delaware	9,809
Gerhold, H.	Publication of genetics problem analysis	Genetics	Penn	3,750

1980

Mader, D.	Soil conditions in relation to decline of roadside sugar maple trees — an exploratory study	Soils	Mass	16,150
Hayward, G.	Changing images of urban forests	S&B	Mass	19,652
Blanchard, R.	Methods to maximize efficacy of injected materials while minimizing injury impact to urban trees	I&D	NH	18,170
Lassoie, J.	Ecophysiological assessment of symptomatic and asymptomatic dose responses of various hardwoods to ozone and sulfur dioxide	Genetics	Cornell	14,375
Wilcox, H.	Characteristics of vesicular-arbuscular mycorrhizae of sugar maple in forest and shade trees	I&D	ESF	19,341
Miller, D.	The momentum balance at the forest-urban edge — Phase I: Wind penetration characteristics of a forest edge	AM	Conn	24,957
McCormick, L.	Mycorrhizae and urban trees: Potential for utilizing the association <i>Quercus palustris</i> plus <i>Pisolithus tinctorius</i>	Soils	Penn	12,860

Steiner, K.	Regional adaptability of green ash and sweetgum provenances for urban forests	Genetics	Penn	23,455
Black, P.	Ecology of a urban recreational water body	Water	ESF	17,781
Wakeley, J.	Food habits, feeding rates, and productivity of urban and rural house sparrows	Wildlife	Penn	23,012
Airola, T.	Urban forestry: Planning and management of residual open space	P&M	Rutgers	13,000
Goldstein, E.	Island analysis in parks planning and management of urban green spaces	Wildlife	Mass	15,625
Richards, N.	Physical characterization of a city's residential greenspace resources	P&M	ESF	19,175
Hawks, R.	Managing residual urban green space	P&M	ESF	13,000
Herrington, L.	Executive Secretary IPA Agreement	Admin	ESF	23,095

1981

Castello, J.	Epidemiology and impact of viruses in the urban tree population	I&D	ESF	28,750
Barrett, J.	Management opportunities in town forests	P&M	NH	15,200
Manning, W.	Effects of chronic foliar ozone injury on root disease incidence in deciduous trees: A study	AQ	Mass	19,375
Valentine, F.	Selection of verticillium-resistant Norway and sugar maple for breeding genetically improved urban planting stock	Genetics	ESF	26,825
Leone, I.	The effect of winter-applied salt spray and chloride uptake and subsequent growth of coniferous and deciduous trees	AQ	Rutgers	25,906
Sydnor, T.	Phenotypic variations in wound-closure rates among <i>Acer</i> cultivars	Genetics	OSU	24,350
Smardon, R.	A study of the utility of "neighborhood forest stands" as a management unit for urban forestry	P&M	ESF	21,695
Karnosky, D.	A field test of the relative ozone tolerance of common urban trees	AQ/Genetics	OT	24,695
Reethof, G. and O. McDaniel	Influence of the forest microclimate on atmospheric sound propagation	AM	Penn	24,646
DeWalle, D.	Windbreak effects on winter mobile home park energy use	AM	Penn	31,854
Herrington, L.	Executive Secretary IPA Agreement	Admin	ESF	20,649
Lassoie, J.	Research planning for the Consortium	Admin	Cornell	10,000

1982

Amundson, R.	Interactive effects of ozone and acidic precipitation on photosynthesis and growth of two eastern deciduous tree species	AQ	Cornell	27,738
Gerhold, H.	Evaluating European cultivars	Genetics	Penn	28,506
Heywood, J.	Recreational use of urban forest resources: A case study of Columbus, Ohio	P&M	OSU	17,787
Myers, R.	Impact of pine wood nematode in the northeastern United States	I&D	Rutgers	24,368
Palmer, J.	Residents' characterization of their residential greenspace resource	S&B	ESF	24,094
Stevens, T.	The benefits and costs of urban forest parks and park attributes	S&B	Mass	15,875
Wakeley, J.	Identifying songbird guilds in urban residential neighborhoods	Wildlife	Penn	26,400
Lassoie, J.	Research planning for the Consortium	Admin	Cornell	10,000

1983

McDaniel, O.	Effectiveness of forest plantings for highway noise abatement	AM	Penn	16,475
Coughlin, R.	An assessment of programs to protect privately owned forests and vegetation in urbanizing areas	P&M	OT	24,462
Mader, D.	Effects of remedial treatments on the condition of declined urban sugar maple trees	Soils	Mass	29,625
Tate, R.	A preliminary investigation of the growth and longevity of urban trees in New Jersey	P&M	Rutgers	26,721
Tate, R.	A decision-making model for street tree inventory systems	TT	Rutgers	3,200
Barrett, J.	Contributions of a community forest to the quality of town and city life	TT	NH	3,500
Brown, T.	Economic values of publicly owned urban forest and the budget allocation process	S&B	Cornell	20,206
Mudge, K.	A screening procedure for selection of ectomycorrhizal fungi capable of enhancing drought stress resistance of host plants	Soils	Cornell	25,371
Pizor, P.	Preserving land for urban forestry: Perspectives from the private sector	P&M	Rutgers	9,784
Herrington, L.	Executive Secretary IPA Agreement	Admin	ESF	7,457
Lassoie, J.	Research planning for the Consortium	Admin	Cornell	21,000

1984

Brennan, E.	An analysis of the impact of ambient ozone on white pine and identification of seedling characteristics associated with the sensitive flash tolerant response	AQ	Rutgers	25,000
Godbey, G.	Development of an evaluation instrument for urban parks using a marketing technique	S&B	OT	20,450
Manning, W.	Interactive effects of ozone and sulfur dioxide on mycorrhizal formation and growth of deciduous trees	AQ	Mass	15,000
Nyland, R.	Development of natural forest communities in exurban areas of Onondaga County, NY	P&M	ESF	18,000
Pellett, N.	Effect of hormone concentration, tree-to-tree variation and time of cutting on rooting of softwood or greenwood cuttings of <u>Betula papyifera</u>	Genetics	Vermont	15,090
Riha, S.	Effect of soil chemical properties on root growth of tree seedlings	Soils	Cornell	25,000
Unknown	Unknown	Admin	Unknown	18,000

APPENDIX SEVEN: Executive Committee Officers and Working Group Chairpersons

Presidents 1971-86

Otis Hall: 1971
 William Kennard: 1972-73
 Richard Pentoney: 1974
 William Smith: 1975-76
 Walter Thomas: 1977-78
 Donald Progulske: 1979-80
 Donald Behrend: 1981-84 (consecutive terms)
 Robert Bond: 1985-86

Executive Secretaries 1978-86

Lee Herrington: July 1978 - September 1981
 David Karnosky: October 1981 - November 1983
 Anne Fege: December 1983-86

Pinchot Program Coordinators 1971-86

Elwood Shafer: 1971 - 1974
 George Moeller: 1975 - 1978
 Brian Payne: 1979 - 1980
 Albert Foulger: 1981 - 1986

WORKING GROUP CHAIRPERSONS

1973-May 1974

AIR QUALITY: William Smith-Yale University
 Eileen Brennan-Rutgers University
 AMENITIES: Lee Herrington-SUNY College of Environmental Science and Forestry
 David Miller-University of Connecticut
 GENETICS: Henry Gerhold-Pennsylvania State University
 PLANNING & MANAGEMENT: Bob Hennigan-SUNY College of Environmental Science and Forestry
 Allen Lewis-SUNY College of Environmental Science and Forestry

June 1974 - May 75

AIR QUALITY: William Smith-Yale University
 Eileen Brennan-Rutgers University
 AMENITIES: Lee Herrington-SUNY College of Environmental Science and Forestry
 David Miller-University of Connecticut
 GENETICS: Henry Gerhold-Pennsylvania State University
 PLANNING & MANAGEMENT: Bob Hennigan-SUNY College of Environmental Science and Forestry
 Allen Lewis-SUNY College of Environmental Science and Forestry
 SOILS: Donald Mader-University of Massachusetts
 Nobel Peterson-University of New Hampshire
 WATER QUALITY: William Sopper-Pennsylvania State University
 Nora Sabadell-Princeton University

June 1975 - May 1976

AIR QUALITY: William Smith-Yale University
 Eileen Brennan-Rutgers University
 AMENITIES: Lee Herrington-SUNY College of Environmental Science and Forestry
 David Miller-University of Connecticut
 GENETICS: Henry Gerhold-Pennsylvania State University
 INSECTS AND DISEASES: Paul Manion-SUNY College of Environmental Science and Forestry
 PLANNING & MANAGEMENT: Bob Hennigan-SUNY College of Environmental Science and Forestry
 Allen Lewis-SUNY College of Environmental Science and Forestry
 SOCIAL & BEHAVIORAL ISSUES: Julius Fabos-University of Massachusetts
 SOILS: Donald Mader-University of Massachusetts
 Nobel Peterson-University of New Hampshire
 WATER QUALITY: William Sopper-Pennsylvania State University
 Nora Sabadell-Princeton University
 WILDLIFE: Larry VanDruff-SUNY College of Environmental Science and Forestry

June 1976 - May 1977

AIR QUALITY: William Smith-Yale University
 Eileen Brennan-Rutgers University
 AMENITIES: Lee Herrington-SUNY College of Environmental Science and Forestry
 David Miller-University of Connecticut
 GENETICS: Henry Gerhold-Pennsylvania State University
 INSECTS AND DISEASES: Paul Manion-SUNY College of Environmental Science and Forestry
 Donald Zepp-Cornell University
 PLANNING & MANAGEMENT: Allen Lewis-SUNY College of Environmental Science and Forestry
 SOCIAL & BEHAVIORAL ISSUES: Julius Fabos-University of Massachusetts
 SOILS: Donald Mader-University of Massachusetts
 Nobel Peterson-University of New Hampshire
 WATER QUALITY: William Sopper-Pennsylvania State University
 Nora Sabadell-Princeton University
 WILDLIFE: Larry VanDruff-SUNY College of Environmental Science and Forestry
 John George-Pennsylvania State University

June 1977 - May 1978

AIR QUALITY: William Smith-Yale University
 Eileen Brennan-Rutgers University
 AMENITIES: Lee Herrington-SUNY College of Environmental Science and Forestry
 David Miller-University of Connecticut
 GENETICS: Henry Gerhold-Pennsylvania State University
 INSECTS AND DISEASES: Paul Manion-SUNY College of Environmental Science and Forestry
 Donald Zepp-Cornell University
 PLANNING & MANAGEMENT: Allen Lewis-SUNY College of Environmental Science and Forestry
 SOCIAL & BEHAVIORAL ISSUES: Richard Knopf-Pennsylvania State University
 SOILS: Donald Mader-University of Massachusetts
 Phillip Craul-SUNY College of Environmental Science and Forestry
 WATER QUALITY: William Sopper-Pennsylvania State University
 Nora Sabadell-Princeton University
 WILDLIFE: Larry VanDruff-SUNY College of Environmental Science and Forestry
 John George-Pennsylvania State University

June 1978 - May 1979

AIR QUALITY: James Lassoie-Cornell University
 William Manning-University of Massachusetts
 AMENITIES: David DeWalle-Pennsylvania State University
 David Miller-University of Connecticut
 GENETICS: Henry Gerhold-Pennsylvania State University
 David Karnosky-Cary Arboretum
 INSECTS AND DISEASES: Paul Manion-SUNY College of Environmental Science and Forestry
 PLANNING & MANAGEMENT: Allen Lewis-SUNY College of Environmental Science and Forestry
 SOCIAL & BEHAVIORAL ISSUES: Ben Twight-Pennsylvania State University
 SOILS: Donald Mader-University of Massachusetts
 Phillip Craul-SUNY College of Environmental Science and Forestry
 WATER QUALITY: William Sopper-Pennsylvania State University
 WILDLIFE: John George-Pennsylvania State University

June 1979 - May 1980

AIR QUALITY: James Lassoie-Cornell University
 AMENITIES: David Miller-University of Connecticut
 GENETICS: Henry Gerhold-Pennsylvania State University
 INSECTS AND DISEASES: Paul Manion-SUNY College of Environmental Science and Forestry
 PLANNING & MANAGEMENT: Peter Pizor-Rutgers University
 SOCIAL & BEHAVIORAL ISSUES: Ben Twight-Pennsylvania State University
 SOILS: Phillip Craul-SUNY College of Environmental Science and Forestry
 WATER QUALITY: Peter Black-SUNY College of Environmental Science and Forestry
 WILDLIFE: John George-Pennsylvania State University

June 1980 - May 1981

AIR QUALITY: James Lassoie-Cornell University
 AMENITIES: Oliver McDaniel-Pennsylvania State University
 GENETICS: David Karnosky-Cary Arboretum
 INSECTS AND DISEASES: Paul Manion-SUNY College of Environmental Science and Forestry
 PLANNING & MANAGEMENT: Tev Airola-Rutgers University
 SOCIAL & BEHAVIORAL ISSUES: Ben Twight-Pennsylvania State University
 SOILS: Phillip Craul-SUNY College of Environmental Science and Forestry
 WATER QUALITY: Peter Black-SUNY College of Environmental Science and Forestry
 WILDLIFE: James Wakeley-Pennsylvania State University

June 1981 - May 1982

AIR QUALITY: James Lassoie-Cornell University
 AMENITIES: Oliver McDaniel-Pennsylvania State University
 GENETICS: Kim Steiner-Pennsylvania State University
 INSECTS AND DISEASES: Ronald Myers-Rutgers University
 Joseph Peterson-Rutgers University
 PLANNING & MANAGEMENT: Tev Airola-Rutgers University
 SOCIAL & BEHAVIORAL ISSUES: Jeff Hayward-University of Massachusetts
 SOILS: John Vimmerstedt-Ohio State University
 WATER QUALITY: Peter Black-SUNY College of Environmental Science and Forestry
 WILDLIFE: David Capen-University of Vermont

June 1982 - May 1983

AIR QUALITY: James Lassoie-Cornell University
AMENITIES: Oliver McDaniel-Pennsylvania State University
GENETICS: Kim Steiner-Pennsylvania State University
INSECTS AND DISEASES: Ronald Myers-Rutgers University
PLANNING & MANAGEMENT: Tev Airola-Rutgers University
SOCIAL & BEHAVIORAL ISSUES: Jeff Hayward-University of Massachusetts
SOILS: John Vimmerstedt-Ohio State University
WATER QUALITY: Peter Black-SUNY College of Environmental Science and Forestry
WILDLIFE: David Capen-University of Vermont

June 1983 - May 1984

AIR QUALITY: Ida Leone-Rutgers University
AMENITIES: David DeWalle-Pennsylvania State University
GENETICS: Kim Steiner-Pennsylvania State University
INSECTS AND DISEASES: Ron Myers-Rutgers University
PLANNING & MANAGEMENT: Tev Airola-Rutgers University
SOCIAL & BEHAVIORAL ISSUES: Jeff Hayward-University of Massachusetts
SOILS: John Vimmerstedt-Ohio State University
WATER QUALITY: Peter Black-SUNY College of Environmental Science and Forestry
WILDLIFE: David Capen-University of Vermont

June 1984 - May 1985

AIR QUALITY: Ida Leone-Rutgers University
AMENITIES: David DeWalle-Pennsylvania State University
GENETICS: Kim Steiner-Pennsylvania State University
INSECTS AND DISEASES: Vacant
PLANNING & MANAGEMENT: Tev Airola-Rutgers University
SOCIAL & BEHAVIORAL ISSUES: James Palmer-SUNY College of Environmental Science and Forestry
SOILS: John Vimmerstedt-Ohio State University
WATER QUALITY: James Lynch-Pennsylvania State University
WILDLIFE: David Capen-University of Vermont

APPENDIX EIGHT: Consortium-Related Symposia

- 1972 — **Symposium on Recycling Treated Municipal Wastewater and Sludge Through Forest and Cropland**, August 21-24 (Pennsylvania State University); sponsored by the EPA Office of Research and Monitoring and the Consortium for Environmental Forestry Studies, in conjunction with Pennsylvania State University.
- 1973 — **Conference on Landscape Assessment**, November 15-16 (University of Massachusetts); sponsored by the the Consortium for Environmental Forestry Studies, ASLA Foundation, Conservation Foundation, University of Massachusetts, and the US Army Corps of Engineers.
- **Symposium on Municipal Watershed Management**, September 11-12, and 19-20 (Pennsylvania State University and University of New Hampshire, respectively); sponsored by Pennsylvania State University, University of New Hampshire, USDI Office of Water Resources Research, and the Consortium for Environmental Forestry Studies, in conjunction with the American Water Works Association, New England Water Works Association, and the Pennsylvania Department of Environmental Resources.
- **Symposium on Wildlife in an Urbanizing Environment**, November 27-29 (Springfield, MA); sponsored by the Cooperative Extension Service, in conjunction with the USDA Forest Service, University of Massachusetts, Massachusetts Division of Fisheries and Game, USDI Massachusetts Cooperative Wildlife Research Unit, Massachusetts Audubon Society, and the Wildlife Society.
- 1975 — **Symposium-Fair on Children, Nature, and the Urban Environment**, May 19-23 (Washington DC); sponsored by the USDA Forest Service and the Consortium for Environmental Forestry Studies, in conjunction with George Washington University and SUNJ Cook College.
- **Conference on Metropolitan Physical Environment**, August 25-29 (Syracuse, NY); sponsored by the Consortium for Environmental Forestry Studies, in conjunction with SUNY College of Environmental Science and Forestry and the American Meteorological Society.
- **Symposium on Better Trees for Metropolitan Environments**, November 4-6 (Washington DC); sponsored by the USDA Agricultural Research Service, USDA Forest Service, and Pennsylvania State University, in conjunction with the Consortium for Environmental Forestry Studies and the Metropolitan Tree Improvement Alliance (METRIA).
- 1977 — **Symposium on Utilization of Municipal Sewage Effluent and Sludge on Forest and Disturbed Land Symposium**, March 21-23 (Philadelphia, PA); sponsored by the Consortium for Environmental Forestry Studies, in conjunction with Pennsylvania State University, USDA Forest Service, USDI Office of Water Research and Technology, and the US Environmental Protection Agency.
- 1978 — **National Conference on Urban Forestry**, November 13-16 (Washington DC); sponsored by the USDA Forest Service, SUNY College of Environmental Science and Forestry, and the Consortium for Environmental Forestry Studies.
- 1979 — **Evaluation of Timber Harvesting and Watershed Management Practices in Relation to Contemporary Environmental Standards; A Workshop For The Resource Manager**, September 12-13 (Pennsylvania State University); sponsored by the Consortium for Environmental Forestry Studies.
- 1982 — **Symposium on Urban Soils**, April 26-28 (University of Maryland); sponsored by SUNY College of Environmental Science and Forestry, USDI National Park Service, and the Consortium for Environmental Forestry Studies.

APPENDIX NINE: Working Group Bibliography

The following is a summation of papers, reports, articles, and presentations that were generated at least in part by Consortium grants awarded between 1971-84. The list totals some 330 separate items, many of which are still referenced in important research and technical papers today.

Approximately fifty have been abstracted for the benefit of the reader. The author wishes to point out that choosing the fifty was a very difficult and subjective task, and in no way intends to decry the efforts of those authors not included. Any new knowledge is important in its own way, and should be recognized as such, even if the benefits are not immediately recognizable.

Some references were published before the working group under which they are listed had been formed. As well as simplifying the bibliography, this was done because the author's particular area of study coincided with the research topics of that working group.

Unless otherwise indicated, all final reports were submitted to the Consortium, and are unpublished.

***** AIR QUALITY WORKING GROUP

1973

Oliver, D.J. 1973. **Carbon Monoxide Fixation by Olants**. M.S. Thesis. SUNY College of Environmental Science and Forestry, Syracuse, NY. 89pp.

1974

Oliver, D.J., S.I. Cameron and M. Schaedle. 1974. **A Simple Carbon Dioxide Injection System for Photosynthetic Studies**. Plant Physiology, 54: 649-651.

Rhoads, A.F. and E. Brennan. 1974. **Impact of Air Pollution on Trees in New Jersey**. In: Proc. Amer. Phytopathological Soc., 1: 142.

Rhoads, A.F. and E. Brennan. 1974. **Air Pollution Effects Studied**. American Christmas Tree Journal, (February): 25-28.

1975

Brennan, E. 1975. **Assessment of the Impact of Air Pollution on Trees in New Jersey**; final report. 13pp. (mimeo)

Rhoads, A.F. and E. Brennan. 1975. **Fluoride Damage to Woody Vegetation in New Jersey in 1974**. Plant Disease Reporter, 59 (5): 427-429.

During a two-year study to assess the impact of air pollution on New Jersey trees, two incidents of severe and extensive damage caused by fluorides were observed. In each case, broad-leaved plants and several species of oak showed classic fluoride toxicity symptoms, while some pines were unusual in that a dark band delineating the necrotic area on the needle appeared 3-4 weeks after the initial injury occurred. Douglas fir and peach trees both successfully resumed growth following defoliation. Several other species exhibited extreme resistance to fluoride damage.

Smith, W.H. 1975. **Influence of Particulate Metal Air Contaminants on Talar Pathogens of Urban Trees**; final report. 33pp.

Smith, W.H. and L.S. Dochinger (eds.). 1975. **A Problem Analysis for Environmental Forestry Research: Air Pollution and Metropolitan Woody Vegetation**. Yale University Printing Service, New Haven, CT. 74pp.

This was the first in a series of Problem Analyses required from each Working Group. It presented a research program examining the relationships between air pollutants and woody plants in the metropolitan northeast. Critical research needs included information on the influence of genetic factors, environmental factors, and interaction of air contaminants; the ability of air pollution stress to predispose or aggravate stresses caused by insect, microbial, or abiotic stresses; the ability of woody plants to reduce atmospheric contamination; and the effectiveness of using tolerant varieties to reduce air pollution stress on trees.

Smith, W.H. and B.J. Staskawicz. 1975. **Heavy Metal Effect on *Gonomonia platani* Growth**. In: Proc. Amer. Phytopathological Soc., 2: 108.

1976

Brennan, E. 1976. **Impact of Cultural Developments and Technology of Man on Trees in Urban Ecosystems**; final report. 5pp.

Brennan, E. 1976. **Assessment of Impact of Air Pollution on Trees in New Jersey**; final report. 6pp.

Brennan, E. and A.F. Rhoads. 1976. **The Response of Woody Species to Air Pollutants in an Urban Environment**. J. Arboriculture, 2 (1): 1-5.

The effects on trees of several air pollutants in New Jersey were evaluated. Among the gaseous pollutants found to cause significant damage to many species were ozone and hydrogen fluoride. The latter in particular produced severe necrosis on the current year's needles of such conifers as Norway spruce and Scotch pine. Cement dust extensively damaged a native oak forest some thirty years after the dust had been emitted into the ambient air from a local source. Cadmium was also detected in certain tree species located along heavily traveled highways, particularly pin oak. Unlike the other pollutants, though, it did not cause visible damage to the trees. Conspicuously absent was sulfur dioxide damage, no doubt due to legal restrictions on burning high sulfur fuels during that period.

Groet, S.S. 1976. **Regional and Local Variations in Heavy Metal Concentrations of Bryophytes in the Northeastern United States**. Oikos, 27 (3): 445-456.

Rhoads, A.F. 1976. **Forest Species Show a Delayed Response to Cement Dust in Soil**. J. Arbor. 2 (10): 197-199.

Rhoads, A.F. and E. Brennan. 1976. **Response of Ornamental Plants to Chlorine Contamination in the Atmosphere**. Plant Dis., 60 (5): 409-410.

Smith, W.H. 1976. **Air Pollution — Effects on the Structure and Function of Plant-Surface Microbial-Ecosystems**. In: C.H. Dickinson and T.F. Preece (eds.), *Microbiology of Aerial Plant Surfaces*. Academic Press, NY: 95-105.

1977

- Fahrer, V.S. and H.A. Peters. 1977. **Use of a Land-Use-Based Emissions Inventory in Delineating Clean-Air Zones.** In: Northeastern Forest Experiment Station, Proceedings of the Conference on Metropolitan Physical Environment. USDA Forest Service Gen. Tech. Rep. NE-25. NE. For. Exp. Sta., Broomall, PA: 263-272.
- Koslow, E.E., W.H. Smith and B.J. Staskawicz. 1977. **Lead-Containing Particles on Urban Leaf Surfaces.** Environmental Science and Technology, 11 (10): 1019-1021.
- Rhoads, A.F. and E. Brennan. 1977. **Air Quality as Reflected by Injury to Metropolitan Vegetation.** In: Northeastern Forest Experiment Station, Proceedings of the Conference on Metropolitan Physical Environment. USDA Forest Service Gen. Tech. Rep. NE-25. NE. For. Exp. Sta., Broomall, PA: 303-307.
- Smith, W.H. 1977. **Influence of Heavy Metal Leaf Contaminants on the In Vitro Growth of Urban Tree Phylloplane Fungi.** Microbial Ecology, 3: 231-239.
- Smith, W.H. 1977. **Removal of Atmospheric Particulates by Urban Vegetation: Implications for Human and Vegetative Health.** Yale Journal of Biology and Medicine, 50: 185-191.
- Smith, W.H. and B.J. Staskawicz. 1977. **Trace-Metal Leaf-Pollutants Suppress In Vitro Development of *Gonomonia platani*.** European Journal of Forest Pathology, 7: 51-58.
- Smith, W.H. and B.J. Staskawicz. 1977. **Removal of Atmospheric Particles by Leaves and Twigs of Urban Trees: Some Preliminary Observations and Assessment of Research Needs.** Environmental Management, 1 (4): 317-330.
 A review of the various lines of evidence supporting the hypothesis that above-ground plant parts remove particulates from the atmosphere. In addition to a major literature review, the authors include some scanning electron microscope observations of the particulate burden on leaves of the London plane tree (*Platanus acerifolia*). They also present an outline of the kinds of research required to support or reject the hypothesis that urban woody plants are important air filters, notably determination of the relative efficiency of the important urban deciduous and coniferous species; evaluation of the influence of contamination on plant health; and public education regarding the disposal of dropped leaves and needles that have been contaminated with particulates.
- Smith, W.H. and B.J. Staskawicz. 1977. **Trace-Metal Leaf-Pollutants and Urban Tree Phylloplane Pathogens.** Trans. Brit. Mycol. Soc.

1978

- Feder, W.A. 1978. **Plants as Bioassay Systems for Monitoring Atmospheric Pollutants.** Environmental Health Perspectives, 27: 139-147.

1979

- Harkov, R. 1979. **An Analysis of Edaphic Atmospheric and Foliar Factors Which Alter the Response of Hybrid Poplar Trees to Ozone With Emphasis on the Impact of Oxidant Pollution on Dry Matter Production in Trees.** Ph.D. Dissertation. Rutgers University, New Brunswick, NJ.
- Harkov, R. and E. Brennan. 1979. **An Ecophysiological Analysis of the Susceptibility of Herbaceous and Woody Plants to Oxidant Damage.** In: Ann. Proc. Phytopath. Soc.
- Harkov, R. and E. Brennan. 1979. **Control of Ambient Oxidant Damage in Eastern White Pine.** Plant Pathology Leaflet No. 105, Rutgers University, New Brunswick, NJ: 48-49.
- Harkov, R. and E. Brennan. 1979. **An Ecophysiological Analysis of the Response of Trees to Oxidant Pollution.** *Journal of Air Pollution Control Assoc.* 29 (2): 157-161.
The authors proposed that an ecophysiological analysis of plant response to ozone stress might be more effective than a narrow physiological analysis in identifying those factors that are important in determining the relative susceptibility of various plant species on cultivars. They focused attention particularly on gas exchange phenomena and growth rates of trees under field conditions and on the successional status of the trees. They concluded that slower growing trees, which often typify late successional communities, are less susceptible to ozone damage than rapid-growing tree species which are commonly early successional species.
- Harkov, R., B. Clark, A. Rhoads and E. Brennan. 1979. **Is Ambient Oxidant Detrimental to Hybrid Poplar?** 40th Ann. Meeting, NE. Div. Amer. Phytopathological Soc.
- Harkov, R., B. Clark, T. Lewis and E. Brennan. 1979. **The Significance of Oxidant Injury on Urban Trees and Agricultural Crops in New Jersey in 1978.** *L. Arbor.* 5 (7): 157.

1980

- Harkov, R. and E. Brennan. 1980. **Comparison of Oxidant Injury on Urban Trees and Agricultural Crops in New Jersey in 1978.** In: G. Hopkins (ed.), Proc. First National Conf. on Urban Forestry. Washington, D.C. USDA Forest Service and SUNY College of Environmental Science and Forestry, Syracuse, NY. ESF publ. 80-003: 830.
- Harkov, R. and E. Brennan. 1980. **The Influence of Soil Fertility and Water Stress on the Ozone Response of Hybrid Poplar Trees.** *Phytopathology*, 70 (10): 991-994.
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The photosynthetic response of three crop and four tree species to concentrations of ozone and (for tree species only) simulated acidic rain were measured in field and laboratory experiments. Changes in photosynthesis were seen as reliable indicators of plant stress. The studies revealed that exposure to ozone concentrations typical of those observed in the eastern United States reduced the rates of net photosynthesis in all species tested. These declines in net photosynthesis were related to declines in growth or yield. Species with higher stomatal conductances, and thus higher potential for pollutant uptake, exhibited greater negative responses than those with low stomatal conductance. In contrast, acidic rain had no negative effect on photosynthesis in tree species, and no interaction between ozone and acidic rain was observed.

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- Roth, S.D. 1980. **Ray Tracing Techniques — Derivation and Application for Atmospheric Problems.** M.S. Thesis. Pennsylvania State University, University Park, PA. 55pp.
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- Glaretas, C. 1981. **A New Method for Measuring the Acoustic Impedance of the Ground.** Ph.D. Dissertation. Pennsylvania State University, University Park, PA. 121pp.

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- Potts, D.F. and L.P. Herrington. 1982. **Drought Resistance Adaptations in Urban Honeylocust.** L.Arbor. 8 (3): 75-80.
- Roth, S.D. 1982. **Classification of Atmospheric Turbulence and Its Effect on Sound Propagation; final report.** 12pp.

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DeWalle, D.R. 1983. Energy Conservation Through Urban Forestry. In: Proc. Second National Urban Forestry Conf., Cincinnati, OH. Am. For. Assoc.: 119-123.

DeWalle, D.R. and G.M. Heisler. 1983. Windbreak Effects on Air Infiltration and Space Heating in a Mobile Home. Energy and Buildings, 5: 279-288.

DeWalle, D.R., G.M. Heisler and R.E. Jacobs. 1983. Forest Home Sites Influence Heating and Cooling Energy. J. of For., 81 (2): 84-87.

Li, Z.J. 1983. A Numerical Model of Air Flow Through and Over a Forest Canopy Edge; paper presented at the 7th Amer. Meteor. Soc. Conf. on Fire and Forest Meteorology.

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Walk, M. and D.R. DeWalle. 1983. Coniferous Windbreak Effects on Winter Energy Use in a Mobile Home Park; final report.

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Walk, M., D.R. DeWalle and G.M. Heisler. 1985. Can Windbreaks Reduce Energy Use in a Mobile Home Park? J. of Arbor., 11 (6): 190-195.

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Heisler, G.M. and D.R. DeWalle. 1988. Effects of Windbreak Structure on Wind Flow. Agriculture, Ecosystems and Environment, 22/23: 41-69.

GENETICS WORKING GROUP

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Long, A.J., H.D. Gerhold and M.E. Demeritt, Jr. 1973. **Metropolitan Tree Planters Survey: Initial Results.** Research Paper No. 41. Pennsylvania State University, University Park, PA. 13pp.

1975

Gerhold, H.D., A.J. Long and M.E. Demeritt, Jr. 1975. **Genetic Information Needed For Metropolitan Trees.** J. of For. 73 (3). 150-153.

In the face of deteriorating environments and the rapid arrival of new species and clones into urban settings, the authors argued for a genetic information system that employed performance testing of trees in metropolitan regions. Appearance and adaptive characteristics as related to survival, health, aesthetic values, and maintenance were examined. Principal components of the system were identified as: taxonomic categories; tree characteristics; environments of trees; and organizations. Benefits would be reduced costs through better survival of planted trees, less need for maintenance operations such as spraying or pruning, and a longer useful life span. This system has since been adopted by the Municipal Tree Restoration Program at Pennsylvania State University.

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Davis, D.D. and H.D. Gerhold. 1976. **Selection of Trees for Tolerance of Air Pollutants.** In: F.S. Santamour, Jr., H.D. Gerhold and S. Little (eds.), **Better Trees for Metropolitan Landscapes: Symposium Proceedings.** USDA Forest Service Gen. Tech. Rep. NE-22, NE. For. Exp. Sta., Broomall, PA: 61-66.

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Gerhold, H.D. and K.C. Steiner. 1976. **Selection Practices of Municipal Arborists.** In: F.S. Santamour, Jr., H.D. Gerhold and S. Little (eds.), **Better Trees for Metropolitan Landscapes: Symposium Proceedings.** USDA Forest Service Gen. Tech. Rep. NE-22, NE. For. Exp. Sta., Broomall, PA: 159-166.

Gerhold, H.D. and W.D. Bartoe, II. 1976. **Performance Testing Tree Cultivars in Metropolitan Environments.** J. Arbor. 2 (12): 221-227.

Santamour, F.S., Jr., H.D. Gerhold and S. Little (eds.). 1976. **Better Trees for Metropolitan Landscapes: Symposium Proceedings.** USDA Forest Service Gen. Tech. Rep. NE-22. NE. For. Exp. Sta., Broomall, PA. 256pp.

This 1975 symposium was organized through METRIA and conducted as one of the technology transfer activities of the Genetics Working Group. An international audience of more than 200 forest genetics-related professionals came to the U.S. National Arboretum to hear 29 papers on three themes — selection of trees for metropolitan environments; selection strategies of planners, growers, and breeders; and employing improved varieties. The symposium helped bring together a scattered array of information sources as well as providing various professionals with related goals a rare opportunity to meet.

Steiner, K.C. and H.D. Gerhold. 1976. **Testing and Evaluating New Trees For Metropolitan Landscapes.** In: F.S. Santamour, Jr., H.D. Gerhold and S. Little (eds.), **Better Trees for Metropolitan Landscapes: Symposium Proceedings.** USDA Forest Service Gen. Tech. Rep. NE-22, NE. For. Exp. Sta., Broomall, PA: 227-234.

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Steiner, K.C. 1976. **Better Trees for Urban Environments Discussed in Depth.** Recreation Canada, 34 (4): 37-39.

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Demeritt, M.E., Jr. 1977. **Genetic Evaluation of Two-Year-Height and Ozone Tolerance in Scotch Pine.** Ph.D. Dissertation. Pennsylvania State University, University Park, PA. 69pp.

Gerhold, H.D. 1977. **Testimony Concerning Urban Trees Act of 1977.** US Gov't Print. Off., Serial No. 95-Q: 115-124.

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Bartoe, W.D. and H.D. Gerhold. 1978. **Statistical Designs for Evaluating and Comparing Street Tree Cultivars.** Research Briefs 11 (1). Pennsylvania State University, University Park, PA: 1-2.

Gerhold, H.D. 1978. **History and Goals of METRIA, the Metropolitan Tree Improvement Alliance.** L. Arbor., 4 (3): 62-66.

Gerhold, H.D. and C.J. Sacksteder. 1978. **Urban Tree Testing System Planned for the Northeast.** Science in Agriculture, 25 (2): 10.

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Karnosky, D.F. 1978. **Variation in Sulfur Dioxide and Ozone Tolerances in Some Commonly Planted Urban Trees.** In: Proc. Third Int'l. Congress of Plant Pathology. 5pp. (abstract)

Karnosky, D.F. 1978. **Selection and Testing Programs for Developing Air Pollution Tolerant Trees for Urban Areas.** In: Proc. IUFRO Air Pollution Meeting. Ljubljana, Yugoslavia. S 2.09.00. 8pp.

Karnosky, D.F. and D.B. Houston. 1978. **Genetics of Air Pollution Tolerance of Trees in the Northeastern United States.** In: Proc. NE. For. Tree Improv. Conf., 26: 161-178.

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Sacksteder, C.J. and H.D. Gerhold. 1978. **Japanese Beetle Preferences Among Linden Cultivars.** In: Metro. Tree Improv. Alliance Conf. Proc., Vol. 1: 44-48.

Steiner, K.C. and C.W. Heuser. 1978. **Resistance of Pin Oak to Iron Chlorosis — A Technique for Detecting Genetic Variation.** Penn. Agr. Exp. Sta. J. Paper No. 5174. Pennsylvania State University, University Park, PA. Also, Metro. Tree Improv. Alliance Conf. Proc., Vol. 1: 57-68.

Smith, L.R., F.A. Valentine, R.D. Westfall and P.D. Manion. 1978. **Variation and Its Distribution in Uneven-Aged Urban Street Tree Populations;** invited paper at the 54th International Society Arboriculture Convention, Toronto, Canada.

Valentine, F.A., R.D. Westfall and P.B. Manion. 1978. **Street Tree Assessment By A Survey Sampling Procedure.** L. Arbor., 4 (3): 49-57.

Westfall, R.D., F.A. Valentine, L.R. Smith and P.D. Manion. 1978. **Urban Tree Survey Sampling Can Save You Money!** Poster Presentation at the First National Urban Forestry Conference, Washington DC.

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Bartoe, W.D. and H.D. Gerhold. 1979. **Experimental Designs for Comparing Landscape Tree Cultivars Under City Conditions.** In: Proc. 26th NE. For. Tree Improv. Conf., Pennsylvania State University, University Park, PA: 140-160.

Gerhold, H.D. 1979. **Landscape Trees from Other Countries.** L. Arbor., 5 (7): 156. (abstract)

Gerhold, H.D., W.D. Bartoe and C.J. Sacksteder. 1979. **Selecting and Growing Better Landscape Trees for Northeastern United States: Practices of Arborists and Nurserymen.** Penn. Agr. Exp. Sta. Bull. 829. Pennsylvania State University, University Park, PA. 20pp.

Karnosky, D.F. 1979. **Screening Urban Trees for Air Pollution Tolerance.** L. Arbor., 5 (7): 159. (abstract)

Orton, F.R., Jr. 1979. **Interspecific Hybridization of Cornus.** L. Arbor., 5 (7): 161. (abstract)

Sacksteder, C.J. and H.D. Gerhold. 1979. **A Guide to Urban Tree Inventory Systems.** Research Paper No. 43. Pennsylvania State University, University Park, PA. 52pp.

Sacksteder, C.J. and H.D. Gerhold. 1979. **Street Tree Testing System: Manual for Cooperators.**

Research Paper No. 45. Pennsylvania State University, University Park, PA. 37pp.

The authors developed a testing system that evaluates the performance of street tree cultivars. The program, called STRETEST, is a process for formalizing and summarizing observations of arborists, instead of individuals relying solely on personal experience to recognize the merits of different species and cultivars. Participants are responsible for collecting performance data at specified intervals, while a coordinator provides detailed instructions, analyzes the data, and reports results to all members. The authors strongly recommended that the program be implemented on a national scale.

Steiner, K.C. 1979. **Resistance of Pin Oak and Sweetgum to Iron Chlorosis.** *L. Arbor.* 5 (7): 164. (abstract)

Steiner, K.C. and D.D. Davis. 1979. **Variation Among *Fraxinus* Families in Foliar Response to Ozone.** *Canadian Journal of Forest Research*, 9 (1): 106-109.

Two-month old seedlings of *Fraxinus pennsylvanica* Marsh (green ash) and *F. americana* L. (white ash) were exposed to measured amounts of ozone. It was found that both percentage of leaf surface injury and kind of injury varied significantly among families of the same and different species. This revealed that differences among families in one kind of foliar injury may not necessarily parallel those in another kind of foliar injury. Results also showed that the amount of ozone injury at each symptom category was strongly determined by nodal position of the leaf measured, probably because nodal position is an indicator of leaf maturity. The study suggested that total foliar injury may be a complex of genetically independent symptom responses that should be distinguished to obtain maximum efficiency in genetic selection.

Valentine, F.A. and R.D. Westfall. 1979. **Urban Tree Progeny Tests of Maples.** *L. Arbor.*, 5 (7): 166. (abstract)

Westfall, R.D. and T. Spry. 1979. **Patterns of Isoenzyme Variation in Urban Norway Maple (*Acre platanoides* L.).** West. For. Genet. Assoc., Pac. SW. For. and Range Exp. Sta., Berkeley, CA.

1980

Berrang, P. and K.C. Steiner. 1980. **Resistance of Pin Oak Progenies to Iron Chlorosis.** *Journal of the American Society of Horticultural Science*, 105 (4): 519-522.

Pin oak (*Quercus palustris* Menchh.) is a popular ornamental tree. One disadvantage, however, is its high susceptibility to iron-deficiency chlorosis when grown on neutral to alkaline soils. This study evaluated pin oak progenies from nineteen natural and two cultivated populations for severity of iron chlorosis in solution culture and soil environments. Variation was significant in all progenies of different parents; but rankings varied considerably among experimental populations. Two experiments showed significantly different population means. There was a weak geographic pattern to population means: populations from northcentral and northwestern parts of the species' range were consistently among those most resistant to chlorosis. One population from northern Illinois appeared particularly promising as a candidate for testing and selection.

Karnosky, D.F. 1980. **Consistency From Year to Year in the Response of *Fraxinus pennsylvanica* Provenances to Ozone.** In: Proc. IUFRO Air Pollution Meeting, Zabrze, Poland.

Sacksteder, C.J., H.D. Gerhold and K.C. Steiner. 1980. **TRESYSTM — Tree Records System for Municipalities.** In: G. Hopkins (ed.), Proc. First National Conf. on Urban Forestry. Washington, D.C. USDA Forest Service and SUNY College of Environmental Science and Forestry, Syracuse, NY. ESF publ. 80-003: 838. (abstract)

Steiner, K.C. 1980. **Developing Tree Varieties for Urban Soil Stresses.** In: Proc. Third Metro. Tree Improv. Alliance Conf.: 57-69.

- Steiner, K.C. and A.M. Townsend. 1980. **Influence of Nursery Practices and Tree Improvement on Urban Forests.** In: G. Hopkins (ed.), Proc. First National Conf. on Urban Forestry. Washington, D.C. USDA Forest Service and SUNY College of Environmental Science and Forestry, Syracuse, NY. ESF publ. 80-003: 517-522.

1981

- Gallagher, P. and T.D. Sydnor. 1981. **Variation in Wound-Closure Rates Among *Acer rubrum* Cultivars.** Ohio Agr. Research and Dev. Center Research Circular 263: 23-25.
- Karnosky, D.F. 1981. **Chamber and Field Evaluations of Air Pollution Tolerances of Urban Trees.** *J. Arbor.*, 7 (4): 99-105.
A study demonstrating the wide range of air pollution tolerances of some shade tree cultivars common to the Northeast. The relative sulfur dioxide and ozone tolerances of several cultivars of *Acer*, *Fagus*, *Fraxinus*, *Ginkgo*, *Gleditsia*, *Platanus*, and *Quercus* were examined on the basis of foliar response to short-term, high-concentration chamber fumigations. Field studies were also performed on representatives of the same cultivars in the greater New York City area. The results showed that certain cultivars may prove valuable as bioindicators of the presence of ozone in urban areas.
- Karnosky, D.F. and K.C. Steiner. 1981. **Provenance and Family Variation in Response of *Fraxinus americana* and *F. pennsylvanica* to Ozone and Sulfur Dioxide.** *Phytopathology*, 71 (8): 804-807.
Two-year-old seedlings of *Fraxinus americana* (white ash) and *F. pennsylvanica* (green ash) were exposed to measured concentrations of ozone or sulfur dioxide. Differences in severity of foliar injury among families were significant for both species and both pollutants. Much of this variation could be attributed to genetic origin of the plants. The authors suggested that both species, which are frequently planted as amenity trees, offer considerable potential for genetic improvement in air pollution tolerance; that improvement programs should incorporate both provenance selection and family-within-provenance selection; and that selected individual trees of these two species may serve as sensitive bioindicators of ozone and sulfur dioxide.
- Valentine, F.A., K.D. Carlson, R.D. Westfall and P.D. Manion. 1981. **Testing Verticillium Wilt Resistance in Urban Norway Maples.** *J. Arbor.*, 7 (12): 317-325.
3-year seedlings of *Acer platanoides* (Norway spruce) were inoculated with *Verticillium dahliae*. Wilt symptoms were then analyzed to determine the reliability of predicting disease, variability in the parent population, and heritability. Vascular streaking (dark greenish lesions) and two measures of foliage necrosis (% Crown Necrotic and % Necrosis, Worst Leaf) proved most reliable for predicting infection. These traits were recommended for screening for resistance. Three height growth measures did not prove reliable. Considerable variability was present in the parent populations but estimates of heritabilities for each trait were quite variable.

1982

- Berrang, P.C. and K.C. Steiner. 1982. **Pin Oak Chlorosis Control Promising via Seed Source.** *Science in Agriculture*, 29 (3): 29-38.
- DeWald, L.E. 1982. **Juvenile Performance in a Range-Wide Provenance Study of *Alnus glutinosa*** L. Gaertn. M.S. Thesis. Pennsylvania State University, University Park, PA. 105pp.
- Gallagher, H.D. 1982. **Genetic Variation and Growth Regulator Effects on Wound Response Among *Acer* and *Populus* Taxa.** Ph.D. Dissertation. Ohio State University, Columbus, Ohio. 92pp.

Gerhold, H.D., K.C. Steiner, F.C. Cech and D.F. Karnosky. 1982. A Problem Analysis for Environmental Forestry Research: Genetic Improvement and Urban Trees. US Govt. Print. Off. 65pp.

Completed in 1978, this Problem Analyses summarized research already completed by the Genetics Working Group, and areas that needed coverage in future projects. Improved adaptation of trees so that they can withstand urban stresses and require less maintenance was described as the greatest need. More specifically, seven priorities were recommended — performance testing of cultivars; introducing cultivars from other countries; developing information to optimize improvement strategies; assembling germplasm of important species; creating improved cultivars; developing selection methods for tolerance of urban stresses; and improving methods for vegetative propagation of superior cultivars. Comprehensive literature surveys were also included in separate reports by the four authors.

Gerhold, H.D. and C.J. Sacksteder. 1982. Better Ways of Selecting Trees for Urban Plantings. L. Arbor. 8 (6): 145-153.

Karnosky, D.F., H.D. Gerhold and W.H. Collins. 1982. METRIA Projects on Species Trials and Cultivar Testing. L. Arbor. 8 (7): 178-181.

Karnosky, D.F. and T.R. Myers. 1982. Pollution: New Factor in Diagnosis of Tree Damage. Weeds, Trees, and Turf, 21 (2); Specify Tolerant Trees for Air Polluted Areas. Weeds, Trees, and Turf, 21 (3): 56-62.

A two-part series of very readable articles summarizing air pollution effects on shade trees. The first looks at some of the more important air pollutants and their effects, notably ozone, sulfur dioxide, aerial drifts of herbicides and deicing salts, and hydrogen fluoride. The second looks at ways to reduce the impact of these pollutants, as well as listing the relative tolerances of shade trees to two of them, ozone and deicing salt.

1983

Gallagher, P. and T.D. Sydnor. 1983. Genetic variation in wound closure among *Acer platanoides* L. cultivars. Ohio Agr. Res. and Dev. Center Research Circular No. 274: 38-41.

Gallagher, P. and T.D. Sydnor. 1983. Promotion of Wound Closure in Shade Trees With Exogenously Applied Growth Regulators. L. Arbor. 9 (9): 229-232.

Gallagher, P. and T.D. Sydnor. 1983. Genetic Variation in Wound Response Among Cultivars of *Acer rubrum* L. L. Amer. Soc. Hort. Sci. 108: 744-746.

Gallagher, P. and T.D. Sydnor. 1983. Electrical Resistance Related to Volume of Decay and Discoloration in *Acer saccharinum* L. HortScience, 18.

Gerhold, H.D. 1983. Holland and United States Plan Tree Exchange Program. Science in Agriculture, 30 (2): 6.

Gerhold, H.D., D.F. Karnosky and H.M. Heybroek. 1983. Urban Tree Cultivar Exchange Program of the Netherlands and the United States. L. of Arbor. 9 (12): 309-316.

Steiner, K.C. 1983. A Provenance Test of Green Ash. In: Proc. NE. Forest Tree Improv. Conf., 23: 68-76.

Valentine, F.A. 1983. **Verticillium Resistance Testing in Maples.** In: Proc. Second Nat'l Urban Forestry Conf., Cincinnati, OH. Amer. For. Assoc.: 363. (abstract)

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Sydnor, T.D. 1984. **Ohio's Shade Tree Evaluation Project — In Search of a Well-Adapted Tree.** Arboricultural J., 8 (2): 115-122.

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Gerhold, H.D. 1985. **Performance Testing of Street Tree Cultivars: A Model Project.** L. Arbor., 11 (9): 263-271.

Steiner, K.C., B. Bongarten and R.J. Rousseau. 1985. **Juvenile Performance in a Provenance Test of Sweetgum.** In: Proc. South. For. Tree Improv. Conf., 18: 248-257.

1986

Santamour, F.S., Jr. and K.C. Steiner. 1986. **Borer Damage in Green Ash Trees from Different Provenances.** L. Arbor., 12: 199-201.

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Gerhold, H.D., K.C. Steiner and C.J. Sackstead. 1987. **Management Information Systems for Urban Trees.** L. Arbor., 13 (10): 243-249.

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Steiner, K.C., M.W. Williams, D.H. DeHayes, R.B. Hall, R.T. Eckert, W.T. Bagley, W.A. Lemmien, D.F. Karnosky, K.K. Carter and F.C. Cech. 1988. **Juvenile Performance in a Range-Wide Provenance Test of *Fraxinus pennsylvanica* Marsh.** Silvicultural Genetics, 37: 104-111.

INSECT AND DISEASE WORKING GROUP

1979

- Bardini, F.C. and W.A. Feder. 1979. Effect of Cold Treatment on the *in vitro* Germination and Day-to-Day Variability of Maize (*Zea mays* L.) Pollen. Ann. Bot. 43: 75-79.
- Manion, P. 1979. Insect and Disease Problems of the Urban Environment: Problem Analysis; final report. 5pp.
- O'Callaghan, D.P., E.M. Gallagher and G.N. Lanier. 1979. Field Evaluation of Pheromone- Baited Trap Trees to Control Elm Bark Beetles. Trans. N.Y. Entomol. Soc. 86 (4): 312.

1980

- O'Callaghan, D.P., E.M. Gallagher and G.N. Lanier. 1979. Field Evaluation of Pheromone- Baited Trap Trees to Control Elm Bark Beetles, Vectors of Dutch Elm Disease. Environmental Entomology, 9 (2): 181-185.
- Dutch elm disease can be held at tolerable levels by timely removal and destruction of diseased elm trees (*Ulmus americana*) that serve as beetle breeding sites and reservoirs of the disease. However, the expense and mechanical difficulties of sanitation often result in delays, thus allowing beetles to emerge and transport the Dutch elm disease fungus to healthy elms. In an attempt to resolve this problem, over 250 diseased or unwanted elm trees were poisoned with herbicides before being baited with pheromone "multilure". The baited trees were immediately mass-attacked by elm bark beetles but more than 87 percent of the potential brood was effectively eliminated. A decline in the Dutch elm disease rate accompanied brood elimination. The results showed that trap tree techniques have great potential for enhancing Dutch elm disease control programs.

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- Castello, J.D. and M.T. O'Shea. 1981. Frequency and Distribution of Tobacco Ringspot Virus and Tobacco Mosaic Virus in *Fraxinus* in New York State. Phytopath. 71 (5): 558. (abstract)

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- Myers, R.F. 1982. Histology of Pines Infected with *Bursaphelenchus xylophilus*, the Pinewood Nematode. J. Nematol. 14 (4). (abstract)
- Myers, R.F. 1982. Susceptibility of Pines to Pinewood Nematode in New Jersey. In: J.E. Applebey and R.B. Malek (eds.), Proc. National Pine Wilt Disease Workshop, University of Illinois: 38-46.
- Wisniewski, S.G. 1982. Location of Injection: Effect on Injury Sustained in Red Oak and Sugar Maple. M.S. Thesis. University of New Hampshire, Durham, NH.
- Wisniewski, S.G. and R.O. Blanchard. 1982. Effect of Injection Site on Injury Sustained From Chemical Injections in Oak and Maple. Phytopath. 72 (2): 267. (abstract)

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- Amico, L.A. and J.D. Castello. 1983. Seasonal Fluctuations of Tobacco Mosaic Virus and Tobacco Ringspot Virus Within Tissues of White Ash Trees. Phytopath. 73 (2): 361. (abstract)
- Castello, J.D., L.A. Amico and P. Shiel. 1983. Seasonal Distribution of Tobacco Mosaic Virus in 'Moraine' Ash. Phytopath. 73 (2): 364.
- Myers, R.F. 1983. Comparative Pathology of Conifers Infected with *Bursaphelenchus xylophilus*. J. of Nematology, 15 (4): 486. (abstract)

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- Myers, R.F. 1984. Comparative Histology and Pathology in Conifers Infected with Pine Wood Nematode, *Bursaphelenchus xylophilus*. US-Japan Conference, May 1984.

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- Gustavson, D.R. 1986. Root System and Mycorrhizal Distribution Associated With Urban Sugar Maple Decline. M.S. Thesis. SUNY College of Environmental Science and Forestry, Syracuse, NY. 83pp.+

Planning and Management Working Group

1974

Sherman, R.L., N.C. Shopshire, P.S. Wilson and A.C. Worrell. 1974. **Open Land Policy in Connecticut**. Yale University, School of Forestry and Environmental Studies Bull. 87. 67pp.

1975

Goetsch, C. 1975. **A Guide to Conservation Restrictions**. Connecticut Law Review. 8.

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Brown, T.L., D.J. Miller and B.T. Wilkins. 1977. **Rural Nonfarmed Lands and Their Owners in Five Central New York Counties**. Search, 7 (4). Cornell University Agr. Exp. Sta., Ithaca, NY. 24pp.

Dennison, S.E. and J.S. Mawson. 1977. **A Survey of Solid Waste Disposal Facilities in Franklin, Hampden, and Hampshire Counties of Mass.** University of Mass. Coop. Ext. Ser., Amherst, MA. sp. 103. 80pp.

Gutman, R. and J. Landry. 1977. **An Analysis of Tree Ordinances: The Example of New Jersey**. L. Arbor., 3 (10): 191-197.

Kundell, J.E. 1977. **Municipal Environmental Conservation Commissions in New York State**. Ph.D. Dissertation. SUNY College of Environmental Science and Forestry, Syracuse, NY. 385pp.

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Helb, J.V. 1978. **Summary of the National Development Rights Survey**; paper prepared for the Dept. of Environ. Res., Rutgers University, New Brunswick, NJ. (mimeo)

Lewis, A.R. 1978. **Problem Analysis: Urban Forestry Planning and Management Working Group**; final report. 23pp.

Pizor, P.J. 1978. **A Review of Transfer of Development Rights**. The Appraisal Journal, XLVI (3): 386-396.

Transfer of Development Rights (TDR) is a land-use tool that balances urban growth with environmental preservation. It is based on the premise that title to a parcel of land includes title to a variety of rights, such as the air and mineral rights, associated with that land. Development rights refer to an additional right of land - its development potential. Under TDR, the development potential can be separated from the raw land value (use value) and transferred to another parcel of land. TDR thus allows communities to preserve large areas at low cost, and without removing them from the tax rolls. TDR also provides a fair means of compensation to those landowners whose properties forego development by allowing them to sell their development rights to real estate investors and home builders.

Roy, S.F. 1978. **Alternatives for Conservation Commission Lands: A Process for Management Planning**. M.S. Thesis. University of Massachusetts, Amherst, MA. 274pp.

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- Barrett, J.P., D.S. Linden, J.H. Gove, R.A. Langevin and J.M. Brien. 1979. **Timber Values of Town Forests**. New Hampshire Agr. Exp. Sta. Research Report No. 77. Durham, NH. 44pp.
- Dean, J. and G. Singer. 1979. **Open Space Preservation in the New Jersey Pinelands**. Princeton University Center for Environmental Studies Rep. PU/CES 79. Princeton, NJ.
- Pizor, P.J., G.H. Nieswand and J.A. Swanson. 1979. **A Transfer of Development Rights Sampler: A Collection of TDR Ordinance From Municipalities in Eight States**. New Jersey Agr. Exp. Sta. Bull. 612. New Brunswick, NJ.

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- Barrett, J.P. 1980. **Recreational and Timber Opportunities on Swiss and German Town Forests**. Forest Notes (Society for the Protection of N.H. Forests), 140: 2-5.
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- Irland, L.C. and D.B. Field. 1980. **Impacts of Suburbanization on Timber Growing: A Case Study of the State of Connecticut**. Connecticut Woodlands, XLV (2): 16-21.
- Irland, L.C. and D.B. Field. 1980. **Impacts of Suburbanization on Timber Growing: A Case Study of the State of Connecticut**; final report. University of Maine Cooperative Forestry Research Unit, Orono, ME. 60pp.
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- Airola, T.M. and K. Buchholz. 1982. **Forest Community Relationships of the Greenbrook Sanctuary, New Jersey.** *Bulletin of the Torrey Botany Club*, 109 (2): 205-218.

- Airola, T.M. and D. Wilson. 1982. **Recreational Benefits of Residual Open Space: A Case Study of Four Communities in Northeastern New Jersey.** *Environ. Mgmt.*, 6 (6): 471-484.
 Researchers examined the undervalued recreational resource of residual open spaces (ROS). Their surveys suggested that parks and open space represent a city service that are not as highly valued as other more visible services, that respondents desire a diversity of recreational experiences, that existing parks and open space provide a narrow range of recreational benefits to users, that benefits of existing parks extend primarily to the provision of active pursuits, and that undeveloped residual open spaces are valued for, and provide, opportunities for a variety of passive pursuits. They concluded that failure to recognize the value and utility of such lands may result in the loss of recreational opportunities that are not adequately provided by formal parks and open spaces.

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- Tate, R.L. 1984. **A Component Model for Street Tree Inventory Systems; final report.** 46pp.

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- Smardon, R.C. 1988. **Perception and Aesthetics of the Urban Environment: Review of the Role of Vegetation.** *Landscape and Urban Planning*, 15: 85-106.
 A review of the role played by urban vegetation with regard to human behavior and the perception of urban environments. It includes a summary of the functions or benefits of urban vegetation to human use-economic benefits, instrumental or physiological functions, and perceptual functions including visual, sensory benefits, and symbolic aspects. The author also discusses the roles of urban vegetation in performing these various functions at different environmental scales and in different contexts. Finally, there is a review of means to assess change in the quality of urban vegetation in the environment as well as using vegetation to improve urban environmental perceptual quality.

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In an attempt to measure the contribution of trees to property values, researchers constructed a scale model of a 12-acre lot of undeveloped open land. Photographs were taken of the model with and without trees, and then shown to real estate appraisers, who were asked to estimate per acre land values from the photos. Results showed trees to contribute as much as 27 per cent of the appraised land value. In another related study, trees contributed 7 per cent to property values on average. Only trees six inches or more in diameter had any effect.

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Zube, E.H., R.O. Brush and J.G. Fabos (eds.). 1975. **Landscape Assessment: Value, Perceptions, and Resources**. Halstead Press, NY, NY. 367pp.

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Fabos, J.G. and S.A. Joyner. 1976. **A Landscape Planning Model as an Aid to Decision Making for Community Growth and Management**; paper presented at the Conf. on Environmental Modeling and Simulation. Environmental Protection Agency.

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The Metropolitan Landscape Planning Model Study (METLAND) was an attempt to equalize the urban development planning process by quantifying environmental resources so that decision-makers would consider them on an equal footing with economic and social values. The model predicted changes in land and water resource-use patterns likely to occur under alternative land development programs. This particular study, second in the METLAND series, looks at procedures for assessing: critical landscape resources like prime agricultural land; landscape hazards such as areas prone to floods; the landscape in terms of its natural opportunities for development, including such factors as slope, drainage, and climate; and ecological stability of the landscape.

Fabos, J.G. and K.H. Ferris. 1977. **A Computerized Model for Integrating the Physical Environmental Factors into Metropolitan Landscape Planning**. In: Northeastern Forest Experiment Station, Proc. Conf. on Metropolitan Physical Environment. USDA Forest Service Gen. Tech. Rep. NE-25. NE. For. Exp. Sta., Broomall, PA: 422-431.

Hendrix, W.G. 1977. **Visual Land-Use Compatibility and Scenic Resource Quality**. In: Northeastern Forest Experiment Station, Proc. Conf. on Metropolitan Physical Environment. USDA Forest Service Gen. Tech. Rep. NE-25. NE. For. Exp. Sta., Broomall, PA: 415-421.

Northeastern Forest Experiment Station. 1977. **Children, Nature and the Urban Environment: Proceedings of a Symposium-Fair**. USDA Forest Service Gen. Tech. Rep. 30. NE. For. Exp. Sta., Broomall, PA. 261pp.
This 1975 conference on the meaning of nature to children attracted an international audience of over 500, including children, parents, teachers, scientists, forest managers, and planners. Themes discussed in the more than one hundred papers included the value of natural environments for human development; theory and research on children and the natural environment; education; community approaches to environmental quality for children; and children's environmental resources and the role of designers and planners.

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- Ulrich, R. 1980. **Psychological Effects of Viewing Natural Versus Urban Landscapes**; paper presented at the Annual Meetings of the Assoc. Amer. Geographers. Louisville, KY, April 13-16.
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More, T.A., T.H. Stevens and P.G. Allen. 1982. The Economics of Urban Parks: A Benefit/ Cost Analysis. Parks and Recreation Journal, 17 (8): 31-33.

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Heywood, J.L. and G.W. Mullins. 1983. **Urban Forest Recreation Participation — A Social Research Perspective**; paper presented at the Nat. Rec. and Park Assoc. Congress Symp. Leisure Res. Kansas City, MO.

Mullins, G.W. and J.L. Heywood. 1983. Recreational Use of Urban Forest Resources. The Ohio Journal of Science, 83 (2): 67. (abstract)

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A whole issue of Urban Ecology was devoted to perceptions of nature in the city. In this particular study of residents living near parks in three New England cities, the authors argued that an interest-image-use cycle in the individual's decision-making process may influence the use potential of a park. The cycle, in which interest effects image, which effects use, which affects interest, helps to explain why parks with a negative image can expect poor use. On a more positive note, it also points to the use of information brochures as a means of improving image, and thus usage, of urban parks. Hayward and Weitzer did indeed confirm this in a second study discussed in the paper.
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- Maynard, M.K., G.W. Mullins and J.L. Heywood. 1984. **Urban Forest Recreation in "Test City, USA". Adult Residents' Perceptions of Leisure and Environmental Information Transfer.** In: Proc. Nat. Workshop Assoc. Interpret. Naturalists, Inc. Callaway Gardens, GA: 53-57.
- Palmer, J.F. 1984. **Neighborhoods as Stands in the Urban Forest.** Urban Ecology, 8: 229-241.
The author defines a neighborhood stand as a component of the urban forest composed of contiguous trees, along with associated vegetative and environmental components that have relatively homogeneous social, physical, biological, and perceived characteristics. This paper reports on a study investigating the neighborhood stand concept by describing variation in the character and perceptions of the urban forest in three neighborhoods in Syracuse, NY. Several neighborhood-related patterns were found to exist. In particular, the perception of neighborhood quality is more related to neighborhood location than respondent characteristics and most related to the physical condition of the immediate surrounding environment.
- Twight, B. and R. Knopf. 1984. **Urban Greenspace Issues: What's Important to Managers.** Landscape Research, 9 (2): 28-30.
- Ulrich, R.S. 1984. **View Through a Window May Influence Recovery From Surgery.** Science, 224 (4647): 420-421.
A unique project studying the recovery records of patients following gall bladder surgery in a suburban Pennsylvania hospital. More specifically, records between 1972-81 were examined to determine whether assignment to a room with a window view of a natural setting, which in this case was a small stand of deciduous trees, might have restorative influences. It was found that 23 surgical patients assigned to such a room had shorter postoperative hospital stays, received fewer negative evaluation comments in nurses' notes, and took fewer potent analgesics than 23 matched patients in similar rooms with windows facing a brick building wall. The results had important implications for hospital design and site decisions.

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- Allen, P.G., T.H. Stevens and T.A. More. 1985. **Measuring the Economic Value of Urban Parks: A Caution.** Leisure Sciences, 7: 467-477.

Heywood, J.L. and G.W. Mullins. 1985. Urban Forest Recreation Participation in Columbus and Franklin County, Ohio; final report. Ohio Agr. Res. and Dev. Center, Columbus, OH. 55pp.

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Palmer, J.F. 1988. Residents' Characterization Of Their Residential Greenspace Resource. In: Proc. Conf. Soc. Am. For., Rochester, NY. Soc. Am. For., Bethesda, MD. (in press)

SOILS WORKING GROUP

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- Holmes, F.W. 1974. **Effect on Roadside Sugar Maples of 16 Consecutive Winters of Salt Applications to a Paved Road on a Banked Curve**. Amer. Phytopath. Soc. Annual Meeting, Program 66: 240, item 417.

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- Van der Grinten, M. and B.F. Wilson. 1975. **A Quantitative Assessment of the Impact of Construction on the Remaining Trees in a Planned Housing Development**; progress report. USDA Forest Service. 31pp. (mimeo)

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- Van der Grinten, M. 1976. **The Effects of Housing Developments on Forest Structure, Composition, and Vigor**. M.S. Thesis. University of Massachusetts, Amherst, MA. 58pp.
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- Mader, D.L. and B.F. Wilson. 1977. **The Impact of Land Disturbance During Urban Development on Tree Cost Systems and Tree Vigor, and Means of Ameliorating the Impacts**; final report. 2pp.
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 In five housing developments in Amherst, MA, up to 77 percent of the basal area of the original forest had been removed during the previous ten years. Small trees had been cut and large trees saved, regardless of species. As a result, the percentage of healthy trees decreased in proportion to the percent of basal area removed. Developments also tended to produce an even-aged stand of large trees with reduced vigor. Finally, the absence of any small trees did not allow for the replacement of larger ones as they died. This suggested that developers and homeowners need to conserve more basal areas to maintain healthy trees and/or save more small trees to ensure long-term continuity of the stand.
- Walker, P.A. and D.D. Adrian. 1977. **The effects of Sanitary Landfill Leachate on Algal Growth**. Dept. of Civil Eng. Rep. No. Env. E. 57-77-3 (April). University of Massachusetts, Amherst, MA. 41pp.

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- Tirsch, F.S. and A.A. Jennings. 1978. **Leachate Reactions With Soils Under Anaerobic Conditions.** University of Massachusetts, Dept. of Civil Eng. Rep. No. Env. E. 60-78-3. Amherst, MA. 104pp.

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- Pease, R.W. and D.D. Adrian. 1979. **Complexation Between Organic Molecules and Iron in Anaerobic Landfill Leachate.** In: 33rd Industrial Wastes Conf., Purdue University. Ann Arbor Science Press.
- Walker, P.A. and D.D. Adrian. 1979. **Specific Conductance as a Measure of Treatability of Landfill Leachate in Algal Lagoons.** In: 33rd Industrial Wastes Conf., Purdue University. Ann Arbor Science Press.

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- Craul, P.J. (ed.). 1982. **Urban Forest Soils: A Reference Workbook**. USDA Forest Service, SUNY College of Environmental Science and Forestry, Syracuse, NY, and USDI National Park Service. 185pp. This collection of papers was developed as a handbook for a 1982 urban soils workshop in Maryland. The workshop, intended primarily for practitioners, covered seven themes, as represented in the text — Basic Soil Properties, Ecology of Tree Roots, Soil Compaction, Soil Fertility, Soil Drainage and Infiltration, Silviculture Implications, and On-Site Soil Analysis. The book represented the first real attempt to bring these various components of urban soils together in one publication, and still remains so in 1988.
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1973

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- Kardos, L.T. and W.E. Sopper. 1973. **Effect of Land Disposal of Wastewater on Exchangeable Cations and Other Chemical Elements in the Soil**. In: W.E. Sopper and L.T. Kardos (eds.), *Proc. Symp. on Recycling Treated Municipal Wastewater and Sludge through Forest and Cropland*. Pennsylvania State University Press, University Park, PA: 220-231.
- Sopper, W.E. 1973. **A Decade of Experience in Land Disposal of Municipal Wastewater**. In: *Proc. Symposium on Land Treatment of Secondary Effluent*. Colorado State University, Fort Collins, CO. Info. Series No. 9: 19-61.
- Sopper, W.E. 1973. **Wastewater Recycling on Forest Lands**. In: *Proc. 4th N. Amer. For. Soils Conf.*, Laval University, Quebec, Canada. International Scholarly Book Service, Inc., Portland, OR: 227-243.
- Sopper, W.E. 1973. **Perennial Crop Selection and Management for Municipal Irrigation Systems**. In: *Proc. Recycling Municipal Sludges and Effluents on Land*. Nat. Assoc. of State Univs. and Land Grant Colleges, Washington, D.C.: 143-153.
- Sopper, W.E. and L.T. Kardos (eds.). 1973. **Proceedings of the Symposium on Recycling Treated Municipal Wastewater and Sludge through Forest and Cropland**. Pennsylvania State University Press, University Park, PA. 479pp.
In 1972, 400 participants attended an international symposium on the parameters and constraints of designing and operating land disposal systems for municipal wastewater and sludge under varying environmental conditions. Papers reviewed state-of-the-art knowledge in natural waste recycling, and also noted technological gaps and research needs. The authors summarized these presentations in a volume of significant importance to the field.
- Sopper, W.E. and L.T. Kardos. 1973. **Vegetation Responses to Irrigation With Treated Municipal Wastewater**. In: W.E. Sopper and L.T. Kardos (eds.), *Proc. Symp. on Recycling Treated Municipal Wastewater and Sludge through Forest and Cropland*. Pennsylvania State University Press, University Park, PA: 271-294.

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- Dindal, D.L., D. Schwert and R.A. Norton. 1974. **Effects of Sewage Effluent Disposal on Community Structure of Soil Invertebrates**. In: Jan Vanak (ed.), *Progress in Soil Zoology*. W. Junk. Publ. and Academia, The Hague and Praug: 419-427.
- Richenderfer, J.L. 1974. **Effects of Land Disposal of Treated Municipal Wastewater on the Chemical Properties of Forested Soils**. M.S. Thesis. Pennsylvania State University, University Park, PA. 93pp.

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Northeastern Forest Experiment Station. 1975. **Proceedings of the Symposium on Municipal Watershed Management.** USDA Forest Service Gen. Tech. Rep. NE-13. NE. For. Exp. Sta., Broomall, PA. 196pp.
The 1973 Municipal Watershed Management Symposium, first held at Penn State and then repeated in its entirety at the University of New Hampshire, was an attempt to increase the accessibility of research and management information to its intended audience, which in this case was municipal watershed administrators. Topics discussed in the report include multiple-use management on municipal watersheds, and forest management related to water quality and yield, as well as various case studies from the Northeast.

Richenderfer, J.L., W.E. Sopper and L.T. Kardos. 1975. **Spray-Irrigation of Treated Municipal Sewage Effluent and Its Effect on Chemical Properties of Forest Soils.** USDA Forest Service Gen. Tech. Rep. NE-17. NE. For. Exp. Sta., Broomall, PA. 24pp.

Sabadell, J.E. and R.J. Krack. 1975. **Absorption of Heavy Metals from Wastewater and Sludge on Forest Residuals and Forest Produce Wastes.** In: **Proc. Second National Conf. on Complete Waste Reuse,** Chicago. AICHE Series (sponsored by EPA).

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Wolke, R.H. 1975. **The Preparation, Characterization, and Agricultural Use of Bark-Sewage Compost.** Ph.D. Dissertation. University of New Hampshire, Durham, NH. 110pp.

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Lo, K.M. and D.D. Adrian. 1976. **Digital Computer Simulation and Secondary Effluent Disposal on Land.** In: **Proc. Conf. on Environmental Modeling and Simulation,** Cincinnati, OH.

Nathan, K., G. Nieswand, E.S. Corbett and J.R. Pawlow. 1976. **Rainfall-Runoff Relationships of a Small Drainage Area under Suburban Development.** In: **Proc. Winter Meet. Amer. Soc. of Agr. Engin.,** Chicago, IL. 16pp.+

Nieswand, G.H., T. Shelton, T. Fusille and E.S. Corbett. 1976. **A Study of the Impact of Suburban Development on Water Quality in a Small Watershed.** In: Proc. Winter Meet. Amer. Soc. of Agr. Engin., Chicago, IL. 18pp.

Sidle, R.C. and W.E. Sopper. 1976. **Cadmium Distribution in Forest Ecosystems Irrigated With Treated Municipal Wastewater and Sludge.** Journal of Environmental Quality, 5 (4): 419-422.

Sopper, W.E. 1976. **Renovation of Municipal Wastewater for Groundwater Recharge by the Living Filter Method.** In: J. Tourbien and R.W. Pierson (eds.), *Biological Control of Water Pollution*. University of Pennsylvania Press, Philadelphia, PA: 269-281.

Sopper, W.E., J.A. Lynch and E.S. Corbett (eds.). 1976. **A Problem Analysis for Environmental Forestry Research: Water Resources at the Forest-Urban Interface.** NE. For. Exp. Sta. Gen. Tech. Rep. PA-2. USDA Forest Service, Broomall, PA. 47pp.
This was the second in a series of Problem Analyses prepared by Consortium Working Groups. The report set out a program of research designed to seek solutions for the highest priority needs of urban water supply and urban wastewater disposal in the metropolitan northeast. Top concerns included water quality; wastewater treatment and renovation; the effects of wastewater applications on forest vegetation and soils; surface and groundwater; and reclamation of disturbed land.

1977

Dindal, D.L., D.P. Schwert, J.P. Moreau and L. Theoret. 1977. **Earthworm Communities and Soil Nutrient Levels as Affected by Municipal Wastewater Irrigation.** In: U. Lohm and T. Persson (eds.), *Soil Organisms as Components of Ecosystems*. Ecol. Bull., 25. Stockholm, Sweden: 284-290.

Fusillo, T.V. 1977. **A Study of Water Quality in a Small Urbanizing Watershed.** M.S. Thesis. Rutgers University, New Brunswick, NJ. 150pp.

Fusillo, T.V., G.H. Nieswand and T.B. Shelton. 1977. **Sediment Yields in a Small Watershed Under Suburban Development;** pre-print report. In: Paper of the Journal Series, New Jersey Agr. Exp. Sta., New Brunswick, NJ: 50-57.

Pawlow, J.R. and K. Nathan. 1977. **Impact of Suburban Development on the Rainfall-Runoff Relationship;** pre-print report. In: Paper of the Journal Series, New Jersey Agr. Exp. Sta., New Brunswick, NJ: 93-104.

Pawlow, J.R. 1977. **Effects of Land Use Changes on the Rainfall-Runoff Relationship.** M.S. Thesis. Rutgers University, New Brunswick, NJ. 191pp.

Ungs, M., R.W. Cleary, L. Boersma and S. Yingjajaval. 1977. **The Quantitative Description of Transfer of Water and Chemicals Through Soils.** In: R.C. Loehr (ed.), *Land as a Waste Management Alternative*. Ann Arbor Science Publishers, Inc., Ann Arbor, MI: 109-137.

Walker, P.A. and D.D. Adrian. 1977. **Specific Conductance as a Measure of Treatability of Landfill Leachates in Algal Lagoons.** In: 32nd Industrial Wastes Conf., Purdue University. Ann Arbor Science Press, Inc., Ann Arbor, MI: 558-566.

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Pham, C.H., H.G. Halverson and G.M. Heisler. 1978. **Precipitation and Runoff Water Quality From An Urban Parking Lot and Implications for Tree Growth.** NE For. Exp. Sta. Res. Note NE-253. USDA Forest Service, Broomall, PA. 6pp.

Sopper, W.E. and S.N. Kerr (eds.). 1978. **Proceedings of the Symposium on Utilization of Municipal Sewage Effluent and Sludge on Forest and Disturbed Land.** Pennsylvania State University Press, University Park, PA. 560pp.

This book summarizes a 1977 symposium on the economic and environmental feasibility of applying municipal sewage effluent and sludge to forest land and rehabilitation of land disturbed by surface mining. The crippling energy crisis, increasing scarcity of mineral resources, new reclamation regulations, and the rising cost of commercial fertilizers had all combined to create an upsurge of interest in such applications, and the symposium attempted to review and discuss current knowledge in the field. As well as describing a number of specific studies, the book provides strong evidence that if amounts are carefully applied and managed, sewage effluent and sludge has minimal or nil effect on soils, vegetation, crops, and wildlife.

1979

Murphey, W.K. and D.A. Cowan. 1979. **Bark as a Filter for Iron in Acid Mine Effluents.** In: Utilizing Bark and Wood Residues to Solve Technical Problems, Proc. Forest Products Res. Soc. Madison, WI: 46-55.

Sopper, W.E. 1979. **Surface Applications of Sewage Effluent and Sludge.** In: M.T. Beatty, G.W. Petersen and L.D. Swindale (eds.), Planning the Uses and Management of Land. Agr. Monograph 21, Amer. Soc. Agronomy, Madison, WI: 633-663.

Sopper, W.E., D.R. DeWalle and S.N. Kerr. 1979. **Utilization of Municipal Wastewater and Waste Heat for Energy Production From Forest Biomass.** In: Proc. Symp. Technology for Energy Conservation. Information Transfer Inc., Rockville, MD: 572-581.

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Black, P. 1980. **Parking Lot Impact on Stream Water Quality.** In: Making Watershed Management Work. Proc. ASCE Symposium, Boise, ID: 541.

Black, P. 1980. **Water Quality Patterns During a Storm on a Mall Parking Lot.** Water Resources Bull., 16 (4): 615-620.

Kerr, S.N. and W.E. Sopper. 1980. **Reforestation of Mined Lands.** Land and Water Magazine (October): 14-16.

Sopper, W.E. and S.N. Kerr. 1980. **Cadmium in Forest Ecosystems.** In: J.O. Nriagu, Cadmium in the Environment. John Wiley & Sons Inc.:655-667.

Sopper, W.E. and S.N. Kerr. 1980. **Increased Wood Biomass Production and Land Treatment of Wastewater: An Economic Symbiotic Approach.** In: Proc. Symp. Technology for Energy Conservation. Information Transfer, Inc., Silver Springs, MD: 118-125.

Sopper, W.E. and S.N. Kerr. 1980. **Maximizing Forest Biomass Energy Production by Municipal Wastewater Irrigation.** In: *Energy from Biomass and Wastes*. Inst. of Gas Tech., Chicago, IL: 115-133.

Sopper, W.E. and S.N. Kerr. 1980. **Potential Use of Forest Land for Recycling Municipal Wastewater and Sludge.** In: G. Hopkins (ed.), *Proc. First National Conf. on Urban Forestry*. Washington, D.C. USDA Forest Service and SUNY College of Environmental Science and Forestry, Syracuse, NY. ESF publ. 80-003: 392-409.

1981

Ferro, V.A. 1981. **Storm-Related Water Quality Responses of Three Hydrologically Different Waterbodies.** M.S. Thesis. SUNY College of Environmental Science and Forestry, Syracuse, NY. 78pp.

Jennings, A.A. 1981. **Leachate Transport Through Soils.** In: *Sanitary Landfill Leachate Collection and Treatment*. University of Massachusetts, Amherst, MA: 77-96.

Kerr, S.N. and W.E. Sopper. 1981. **Utilization of Municipal Sludge for Woody Biomass Production on Mined Land.** In: *Proc. Symposium on Surface Mining Hydrology, Sedimentology, and Reclamation*. University of Kentucky, Lexington, KY: 313-317.

Stepczuk, C.L. 1981. **A Water Study of Cedar Bay, DeWitt, New York.** M.S. Thesis. SUNY College of Environmental Science and Forestry, Syracuse, NY. 93pp.

Tirsch, F.S. 1981. **Leachate Attenuation by Soils.** In: *Sanitary Landfill Leachate Collection and Treatment*. University of Massachusetts, Amherst, MA: 53-76.

Walker, P.A. and D.D. Adrian. 1981. **Role of Algae in Leachate Treatment.** In: *Sanitary Landfill Leachate Collection and Treatment*. University of Massachusetts, Amherst, MA: 121-136.

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Ferro, V.A. 1982. **Storm-Related Dilution of Conductance in Three Hydrologically Different Waterbodies.** *Water Res. Bull.*, 18 (2): 311-316.

Kerr, S.N. and W.E. Sopper. 1982. **Utilization of Municipal Wastewater and Sludge for Forest Biomass Production on Marginal and Disturbed Land.** In: W.E. Sopper et al. (eds.), *Municipal Wastewater and Sludge for Land Reclamation and Biomass Production*. Penn State Press, University Park, PA: 75-87.

1983

Lynch, J.A., E.S. Corbett and C.M. Hanna. 1983. **Predicting Fluctuation in Non-Point Source Pollution from Forested Watersheds During Episodic Events.** Institute for Research on Land and Water Resources, Research Project Technical Completion Rep. LW8302. Pennsylvania State University, University Park, PA. 100pp.

One of the first Consortium studies to look at the impact of acid precipitation. On a central Pennsylvania watershed receiving rain with a pH of 4.0, stream discharge during eighteen storms were sampled and analyzed for pH, bicarbonate alkalinity, and titratable acidity levels. Stream pH and alkalinity levels were found to react inversely to stream discharge during stormflow periods, with their lowest levels occurring almost simultaneously with the peak flow. However, some residual alkalinity was always detectable in the streamwater. In comparison, stormflow acidity was closely related to the discharge rate, with the peaks nearly coinciding. These results clearly indicated that acid rain can produce significant chemical changes in streamwater during stormflow periods.

WILDLIFE WORKING GROUP

1973

DeGraaf, R.M. and J.W. Thomas. 1973. **Wildlife Research in the City: The Forest Service Program.** In: Trans. 30th NE. Fish Wildl. Conf.: 29-44.

Thomas, J.W., R.O. Brush and R.M. DeGraaf. 1973. **Invite Wildlife to Your Backyard.** National Wildlife, 11 (3): 5-16.

This article became one of the National Wildlife Federation's most popular reprints, selling over 1.5 million copies. It explains how to design a garden that would attract a wide variety of wildlife through careful planting of trees, shrubs, flowers, and other vegetation. By providing for the four basic needs — food, water, cover, and breeding areas — urban residents can enjoy any one of four kinds of garden and associated species. The idea of bringing wildlife into the urban backyard is a important one, for it allows children as well as adults to become intimately involved with a living ecosystem.

Thomas, J.W. and R.M. DeGraaf. 1973. **Nongame Wildlife Research in Megalopolis: The Forest Service Program.** USDA Forest Service Gen. Tech. Rep. NE-4. NE. For. Exp. Sta., Broomall, PA. 12pp.

1974

DeGraaf, R.M. and J.W. Thomas. 1974. **Toward Nongame Management.** Massachusetts Wildlife, 25: 14-15.

DeGraaf, R.M. and J.W. Thomas. 1974. **A Strategy for Wildlife Research in Urban Areas.** In: J.H. Noyes and D.R. Progulske (eds.), Proc. Symp. on Wildlife in an Urbanizing Environment. University of Massachusetts Coop. Extension Serv., Monograph Series No. 28. Amherst, MA: 53-56.

DeGraaf, R.M. and J.W. Thomas. 1974. **A Banquet for the Birds.** Natural History, 83: 40-45.

Another wildlife piece written for the lay public, this time discussing a study of how a large number of homeowners who are not otherwise involved in conservation or wildlife use bird feeders. Almost half were found to feed birds during the critical winter months. As well as data on actual household expenditures, the results show that the larger a city population size, the smaller the percentage of people that use bird feeders. Also discussed are some effects of wild bird feeding, notably decreased winter mortality rates and the more frequent winter sightings of some southerly and migratory species. The authors conclude that feeding wild birds is worth as much as \$50 million each year.

Galli, A.E. 1974. **Bird Species Diversity and the Size of Oak Woods in Central New Jersey.** M.S. Thesis. Rutgers University, New Brunswick, NJ. 61pp.

Noyes, J.H. and D.R. Progulske (eds.). 1974. **Proc. Symp. on Wildlife in an Urbanizing Environment.** University of Massachusetts Coop. Extension Serv., Monograph Series No. 28. Amherst, MA. 182pp.

A symposium designed specifically to consider the role and future of wildlife in areas of increasing urbanization and population densities. Themes included the philosophical aspects of urban wildlife, the public and private role in urban wildlife management, as well as some examples of on-going research. Also among the more than thirty papers were discussions on people's perceptions and reactions to urban wildlife, techniques for evaluating wildlife habitat, and the potential for effective educational programs.

Thomas, J.W. and R.M. DeGraaf. 1974. **Raccoons on the Roof.** In: *Gardening With Wildlife*. National Wildlife Federation, Washington D.C.: 153-168.

Thomas, J.W., R.M. DeGraaf and J.C. Mawson. 1974. **A Technique for Evaluating Bird Habitat.** In: J.H. Noyes and D.R. Progulske (eds.), *Proc. Symp. on Wildlife in an Urbanizing Environment*. University of Massachusetts Coop. Extension Serv., Monograph Series No. 28. Amherst, MA: 159-162.

1975

DeGraaf, R.M. 1975. **Wildlife Considerations in Metropolitan Environments.** In: *Proc. Ann. Con. Soc. Am. For.*: 22-26.

DeGraaf, R.M. and B.R. Payne. 1975. **Economic Values of Nongame Birds and Some Research Needs.** *Trans. N. Am. Wildl. Nat. Res. Conf.*, 40: 281-287.

Forman, R.T. and B.A. Elfstrom. 1975. **Forest Structure Comparison of Hutcheson Memorial Forest and Eight-Year-Old Woods on the New Jersey Piedmont.** *Wm. L. Hutcheson Mem. For. Bull.*, 3 (2): 44-51.

Pasquini, C.G. 1975. **Bird Species Diversity as Related to Vegetational Features and Recreational Use in an Urban Park.** M.S. Thesis. University of Massachusetts, Amherst, MA. 160pp.

Payne, B.R. and R.M. DeGraaf. 1975. **Economic Values and Recreational Trends Associated With Nongame Birds.** In: *Proc. Symp. Forest and Range Habitat Management for Nongame Birds*. USDA Forest Service Gen. Tech. Rep. WO-1.

Rudis, V.A. 1975. **Urbanization as a Multiple Stress Affecting Forest Soil Arthropod Communities.** M.S. Thesis. Rutgers University, New Brunswick, NJ. 101pp.

1976

Allen, E.B. and R.T. Forman. 1976. **Plant Species Removals and Old Field Community Structure and Stability.** *Ecology*, 57 (6): 1233-1243.

The roles of species abundance, community structure, and competitive relationships in community recovery following stress were studied by separately removing plant species in three 16-year-old fields in New Jersey. Community recovery correlated inversely with cover of species removed. However, the order of species according to cover differed from the order of amounts of community recovery, indicating that species rank by abundance may be an inadequate measure of relative importance of a species in the community. High community recovery correlated with vertical stratification, horizontal patchiness, abundance of rapid vegetatively reproducing species, and differential species interactions. Species diversity changed negligibly following removal of a species.

DeGraaf, R.M., T.W. Anderson and E.H. Zube. 1976. **Relating Wildlife to Scenic Resource Value.** *Man-Environment*, 6 (1): 63-64.

DeGraaf, R.M. and J.W. Thomas. 1976. **Wildlife Habitats in the City.** In: D. Euler, F. Gilbert and G. McKeating (eds.), *Wildlife in Urban Canada*. University of Guelph, Ontario, Canada: 48-68.

DeGraaf, R.M. and J.W. Thomas. 1976. **Wildlife Habitat In or Near Cities**. In: J. Andresen (ed.), *Trees and Forests for Human Settlements*. Center for Urban Forestry Studies, University of Toronto: 54-62.

Elfstrom, B.A. 1976. **Tree Species Diversity and Forest Island Size on the Piedmont of New Jersey**. M.S. Thesis. Rutgers University, New Brunswick, NJ. 73pp.

Forman, R.T., A.E. Galli and C.F. Leck. 1976. **Forest Size and Avian Diversity in New Jersey Woodlots, With Some Land-Use Implications**. *Oecologia* 26 (1): 1-8.

The effect of forest size on avian diversity was studied in oak forest patches in rural New Jersey. The number of bird species continued to increase significantly in old oak woods up through 40 ha. This was due to the progressive addition of carnivorous species with increasing minimum forest size requirements. One large woodlot had more species than the same area subdivided into smaller woodlots. To maintain maximum regional diversity, more than three large forests are required. The primary land use priority should be to protect large forests, followed by maintenance of a high density of small woodlots.

Galli, A.E., C.F. Leck and R.T. Forman. 1976. **Avian Distribution Patterns in Forest Islands of Different Sizes in Central New Jersey**. *The Auk*, 93 (2): 356-364.

Mawson, J.C., J.W. Thomas and R.M. DeGraaf. 1976. **Program HTVOL — The Determination of Tree Crown by Layers**. NE. For. Exp. Sta. Res. Paper NE-354. 9pp.

Paulick, R.K. 1976. **The Determination of Habitat Components Utilized by Avian Species in A Planned Suburban Community**. M.S. Thesis. Pennsylvania State University, University Park, PA. 118pp.

Paulick, R.K. and J.L. George. 1976. **Avian Utilization of a Planned Community**. Abstr. An. Meet. Wilson Ornithol. Soc.: 3-4.

1978

Coon, R.A., J.S. Lindzey and J.L. George. 1978. **Nesting, Fall Migration, and Harvest of American Woodcock in Pennsylvania**. *Research Briefs*, 11 (1). Pennsylvania State University, University Park, PA.

DeGraaf, R.M. 1978. **Avian Communities and Habitat Associations in Cities and Suburbs**. In: C.M. Kirkpatrick (ed.), *Proc. Symp. on Wildlife and People*. Purdue University: 7-24.

Paulick, R.K. and J.L. George. 1978. **Determination of Habitat Components Utilized by Avian Species in a Planned Suburban Community**. *Research Briefs*, 11 (1). Pennsylvania State University, University Park, PA: 19-21.

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Capen, D.E., R.J. Cooper and R.M. DeGraaf. 1979. **Population Trends of Northeastern Birds**. Trans. 36th NE. Fish Wildl. Conf.: 69-75.

DeGraaf, R.M. and G.M. Witman. 1979. **Trees, Shrubs and Vines for Attracting Birds — A Manual for the Northeast**. University of Massachusetts Press, Amherst, MA. 194pp.

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Gehringer, S.D. 1980. **Songbird-Habitat Relationships in an Urban Environment.** M.S. Thesis. Pennsylvania State University, University Park, PA. 110pp.

Rowse, R.N. 1980. **An Abundance Survey and Habitat-Affinity Analysis of Mammals in Syracuse, New York.** M.S. Thesis. SUNY College of Environmental Science and Forestry, Syracuse, NY. 130pp.

1981

DeGraaf, R.M. and J.M. Wentworth. 1981. **Urban Bird Communities and Habitats in New England.** Trans. N. Am. Wildl. Nat. Res. Conf., 46: 396-413.

Goldstein, E.L., M. Gross and R.M. DeGraaf. 1981. **Explorations in Bird-Land Geometry.** Urban Ecology, 5: 113-124.

Morris, L.J. 1981. **Characteristics of Municipal Street Trees for Attracting Urban Songbirds.** M.S. Thesis. Pennsylvania State University, University Park, PA. 92pp.

Snyder, A.P. and J.L. George. 1981. **Wildlife-Related Activities and Attitudes of Pennsylvanians.** Trans. N. Am. Wildl. Nat. Res. Conf., 46: 455-462.

Winter, W.R. 1981. **Role of Feeding Stations in Managing Non-Game Bird Habitat in Urban and Suburban Areas.** M.S. Thesis. Pennsylvania State University, University Park, PA. 70pp.

Winter, W.R. and J.L. George. 1981. **Role of Feeding Stations in Managing Non-Game Bird Habitat in Urban and Suburban Areas.** Trans. N. Am. Wildl. Nat. Res. Conf., 46: 414-423.

1982

George, J.L. 1982. **Urban Wildlife: A Problem Analysis for Environmental Forestry Research.** Agricultural Experiment Station, Pennsylvania State University, University Park, PA. 22pp.
John George developed a research program that focused mainly on birds and mammals. It was divided into three components, namely the determination of human preferences and attitudes toward urban wildlife; habitat requirements and ecological characteristics of urban wildlife; and methods for increasing desirable human-wildlife interactions. The Problem Analysis also included a comprehensive summary of current research in urban wildlife.

Johnsen, A.M., III. 1982. **Urban Habitat Use by House Sparrows, Rock Doves, and Starlings.** M.S. Thesis. SUNY College of Environmental Science and Forestry, Syracuse, NY. 75pp.

1983

Gavett, A.P. 1983. **Food Habitats and Blood Constituents of Urban and Rural House Sparrows.** M.S. Thesis. Pennsylvania State University, University Park, PA. 58pp.

Goldstein, E.L., M. Gross and R.M. DeGraaf. 1983. Wildlife and Greenspace Planning in Medium-Scale Residential Developments. Urban Ecology, 7: 201-214.

1985

DeGraaf, R.M. 1985. Residential Forest Structure in Urban and Suburban Environments: Some Wildlife Implications in New England. L. Arbor., 11: 236-241.

1986

DeGraaf, R.M. and J.M. Wentworth. 1986. Avian Guild Structure and Habitat Associations in Suburban Bird Communities. Urban Ecology, 9 (3/4): 399-412.

Breeding bird communities were compared in three different suburbs according to total avian densities and nesting guilds. The authors found that shrub maturity is more important than numbers of shrubs, and that planted trees, no matter how mature or abundant, do not replace natural forest stands as habitat for most insectivorous bird species.

Goldstein, E.L., M. Gross and R.M. DeGraaf. 1986. Breeding Birds and Vegetation: A Quantitative Assessment. Urban Ecology, 9 (3/4): 377-385.

Tzilkowski, W.M., J.S. Wakeley and L.J. Morris. 1986. Relative Use of Municipal Street Trees by Birds During Summer in State College, Pennsylvania. Urban Ecology, 9 (3/4): 387-398.

VanDruff, L.W. and R.N. Rowse. 1986. Habitat Association of Mammals in Syracuse, New York. Urban Ecology, 9 (3/4): 413-434.

1987

DeGraaf, R.M. 1987. Urban Wildlife Habitat Research — Application to Landscape Design. In: L.W. Adams and D.L. Leedy (eds.), Proc. Nat. Symp. on Urban Wildlife. National Institute for Urban Wildlife, Columbia, MD: 107-111.

Johnsen, A.M., III and L.W. VanDruff. 1987. Summer and Winter Distribution of Introduced Bird Species and Native Bird Species Richness Within a Complex Urban Environment. In: L.W. Adams and D.L. Leedy (eds.), Proc. Nat. Symp. on Urban Wildlife. National Institute for Urban Wildlife, Columbia, MD: 123-127.

MISCELLANEOUS

1971

Cliff, E.P. 1971. **Trees and Forests in the Human Environment**. In: S. Little and J.H. Noyes (eds.), **Proc. Symp. on Trees and Forests in an Urbanizing Environment**. Monograph Series No. 17, University of Massachusetts Coop. Ext. Serv., Amherst, MA: 17-21.

Doolittle, W.T. 1971. **Tree Improvement and Environmental Forestry**. NE. Forest Tree Improv. Conf. Proc., 18: 65-69.

Doolittle, W.T. and E.L. Shafer. 1971. **Environmental Forestry Research in the Forest Service**; paper presented at 2nd Nat. Biolog. Congress, Miami, Fl.

Payne, B.R. and J.W. Thomas. 1971. **New Developments in Environmental Forestry Research**. Trans. Tree Wardens, Arborists, and Utilities Conf.: 27-31.

1972

Arnold, R.K. 1972. **Interface Between Man and His Forest Environment**. J. Env. Quality, 1 (2): 117-120.

Shafer, E.L. and W.T. Doolittle. 1972. **The Pinchot Institute...Breaking New Ground Throughout Megalopolis**. Pennsylvania Forests, 63 (1): 20-24.

Thomas, J.W. and B.R. Payne. 1972. **The Pinchot Institute of Environmental Forestry — Research Underway at the Amherst, Massachusetts, Work Unit**. Trans. Tree Wardens, Arborists, and Utilities Conf, 32: 69-74.

1973

Mawson, J.C., E.L. Shafer, Jr., J.W. Thomas, R.W. Wilson, Jr. and D.P. Worley. 1973. **The Pinchot Institute System for Environmental Forestry Studies**. USDA Forest Service Gen. Tech. Rep. NE-2, NE. For. Exp. Sta., Broomall, PA. 60pp.
The authors describe a prototype system for research planning and administration in forestry for metropolitan areas. The system is organized from three different perspectives — social-need, supply-response, and environmental-effect. A series of diagrams show how to use these viewpoints to formulate and evaluate problems. The document provides valuable information and ideas on how to start similar organizations elsewhere.

1976

Riddle, J.R., G.H. Moeller and W.H. Smith. 1976. **Breaking New Ground in Urban America**. American Forests, 83 (11): 26-30+.

1977

- Moeller, G.H. 1977. The Pinchot Institute: Toward Managing Our Urban Forest Resources. L. Arbor. 3 (10): 181-186.

1978

- Little, S. (ed.). 1978. Urban Foresters Notebook. USDA Forest Service Gen. Tech. Rep. NE-49. NE. For. Exp. Sta., Broomall, PA. Regular supplements.
The Urban Foresters Notebook was an attempt to summarize, coordinate and distribute urban forestry research through a visible outlet. Its format was loose-leaf, allowing regular supplements to be added. Unfortunately, most of the proposed up-dates never materialized. Those papers and/or abstracts that did appear followed one of four main themes — benefits of urban trees; culture and protection of the urban forest; management of the urban forest system; and interface with land-use planning. 2800 copies were printed between 1978-80, when the first supplements were distributed. In 1982, the Consortium took over responsibility for it as part of their technology transfer program.

1979

- Payne, B.R. and J.E. Gallaher. 1979. National Urban Forestry Conference. L. For. 77 (5): 284-286.